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(56) Documents Cited

**GB 2019187 A GB 1517912 A EP 0220836 A2  
US 4574987 A US 4421778 A US 4374154 A  
US 4346120 A US 4333954 A US 4146652 A**

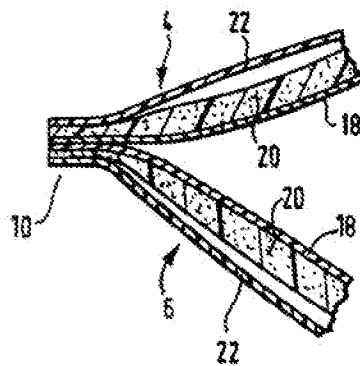
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(54) **Packaged soft serve ice cream**

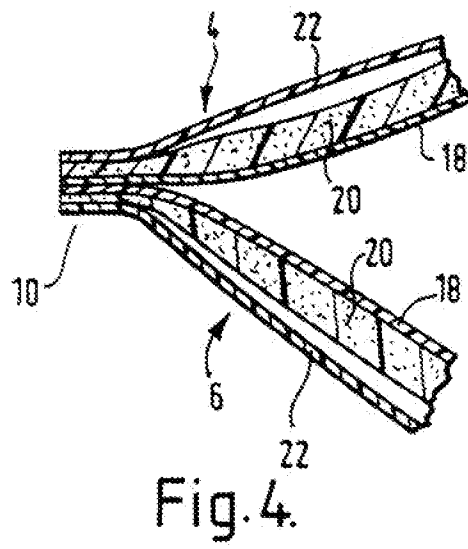
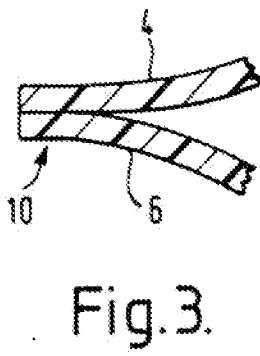
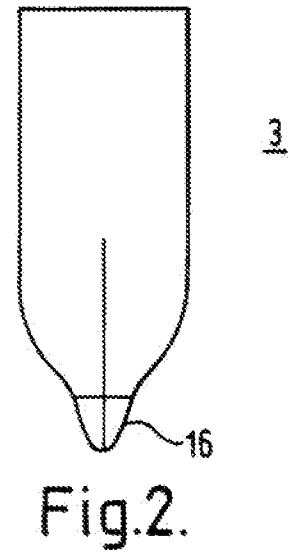
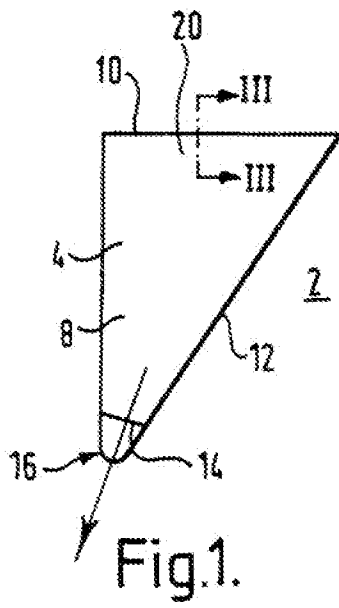
(57) A packaged food product comprises a receptacle having superimposed walls 4, 6 in which is arranged soft-serve ice-cream. Walls 4, 6, include an inner plastics layer 18, a foam layer 20 and an outer plastics layer 22. Between the foam layer 20 and outer layer 22 there is defined an air gap. The ice-cream formulation comprises in a preferred embodiment fat in the form of hydrogenated kernel oil (6 wt%), sucrose (5 wt%), glycerol (7 wt%) and a emulsifier/stabiliser (0.5 wt%).

The product is suitable for dispensing at a temperature of less than -10°C immediately after removal from a domestic freezer.



**Fig. 4.**

**GB 2 304 524 A**



PACKAGED FOOD PRODUCT

This invention relates to a packaged food product and particularly, although not exclusively, relates to packaged ice-cream. The invention also provides ice-cream for extrusion from a flexible receptacle per se and a receptacle for a foodstuff per se.

"Soft-serve" ice-cream of a type sold under the Trade Mark MR WHIPPY has been well-known for about fifty years. The ice-cream may start to freeze at a temperature of about  $-2^{\circ}\text{C}$ . At this temperature, the ice-cream is relatively fluid. It is dispensed at a temperature of about  $-5^{\circ}\text{C}$  to  $-6^{\circ}\text{C}$  using a dispensing machine which incorporates a refrigerated receptacle in which the ice-cream is contained and a pump means arranged to pump ice-cream out of the receptacle via a dispensing nozzle. At the temperature of dispensing, the ice-cream is sufficiently fluid for it to be formed into a spiral arrangement on an ice-cream cone. An elongate cylinder of flaky chocolate, for example one sold under the Trade Mark FLAKE, can then readily be penetrated into the ice-cream. Soft-serve ice-cream is popular, partly in view of its relatively soft texture, but it is only sold in commercial outlets which have the appropriate dispensing machine.

Most ice-cream that is served in households is kept in a deep freeze at a temperature in the range  $-16^{\circ}\text{C}$  to  $-18^{\circ}\text{C}$  prior to serving. The ice-cream is relatively hard at this temperature. For example, to insert a probe at a rate of 1mm/sec into the ice-cream at  $-16^{\circ}\text{C}$  to  $-18^{\circ}\text{C}$  requires a pressure of about 4.5 KPa.

It is known to provide soft frozen dessert products which can be readily extruded upon removal from a home

freezer, for example as described in US 4,374,154. However, the applicant is not aware of any such product having been commercialised in the United Kingdom.

5           The apparent lack of commercialisation may be due to the failure of prior products to satisfactorily address the competing requirements that must be overcome to produce a commercially viable product. For example, the foodstuff, such as ice-cream, to be extruded from a  
10   receptacle must have appropriate fluidity for extrusion by hand immediately after removed from a home freezer; the receptacle must be sufficiently flexible and robust for it to be manipulated a multiplicity of times to enable the foodstuff to be extruded; a minimum amount of cold should  
15   be transmitted to the user's hands during contact with the product and preferably the product should feel relatively warm to the user; a minimum amount of heat should be transmitted, from the user's hands or the surroundings, to the foodstuff in the receptacle so as to minimize the rate  
20   of warming of the foodstuff on removal from the home freezer; it must be possible for the product to remain in a satisfactory state for an extended period of time, for example an hour, during its passage from its point of sale to the home freezer; and the product must be  
25   manufacturable at a commercially viable cost.

          It is an object of the present invention to provide a packaged food product which may be improved, at least in some respects, compared to known products.

30

          According to the invention, there is provided a packaged food product comprising:

a flexible receptacle having a wall which includes first and second layers of flexible material, with an air gap being defined between said layers; and

5        a foodstuff within the receptacle, wherein the foodstuff is adapted to be sufficiently fluid at a temperature of less than (i.e. cooler than)  $-10^{\circ}\text{C}$  such that it can be dispensed from an opening in said receptacle by manual application of a force.

10

Said foodstuff is preferably ice-cream.

Said foodstuff is preferably arranged to be dispensed by a user causing the receptacle to be compressed.  
15        Compression of the receptacle may be aided using a mechanical device. For example, an end of the receptacle remote from the opening may be secured or securable to an axle arranged to be rotated by a user for causing the receptacle to wrap therearound in order to reduce the free  
20        volume of receptacle. Preferably, the foodstuff is arranged to be dispensed without using such a device.

Said first and second layers of flexible material of said receptacle preferably comprise plastics material,  
25        suitably in sheet form. The thickness of said first and/or said second layers may be in the range  $1\text{ }\mu\text{m}$  to  $1\text{ mm}$ , preferably in the range  $5\text{ }\mu\text{m}$  to  $500\text{ }\mu\text{m}$ , more preferably in the range  $5\text{ }\mu\text{m}$  to  $100\text{ }\mu\text{m}$ . Said first layer of material preferably contacts the foodstuff in the  
30        receptacle and is, suitably, a food grade polymeric material, for example polythene. Said second layer preferably is an outermost layer of the receptacle. It preferably incorporates heat reflecting means, for example by including a metallized surface, for reflecting heat

outside the receptacle away from the foodstuff within the receptacle.

5 Said air gap between said first and second layers preferably includes entrapped air therewithin. The air gap may be defined by a foam material arranged between the first and second layers, with air being entrapped within the structure of the foam material. Preferably, however, the air gap comprises an open area.

10

Said wall may incorporate a foam material between said first and second layers. Preferably, the foam material contacts said first layer. It is, however, preferably spaced from said second layer, suitably by said air gap.

15

Said receptacle may comprise first and second walls, each of which may independently have the structure of said wall as described above. The walls may be sealed to one another, for example by heat sealing (or the like) along their free edges to define the receptacle. To this end, said first layers of said respective walls are preferably in contact and are made of a material or materials which allow said layers to be heat sealed to one another. Preferably, both of said first layers are made of the same material. Preferably, each layer of said walls is heat sealable to a respective adjacent layer. Preferably, in sealed regions of said wall or walls, a reduced, or no, air gap is defined between said first and second layers.

25  
30

Said receptacle is preferably non-self-supporting. Said receptacle preferably has a substantially undefined three-dimensional shape. Preferably, said foodstuff substantially defines the three dimensional shape. Said receptacle preferably tapers inwardly towards a region in

35

which said receptacle is arranged to define said opening. Said receptacle may include a preformed opening, for example a hole in a wall of the receptacle. Prior to dispense, for example prior to initial opening of the  
5 receptacle, the opening may be closed by a removable closure means. Said closure means may be arranged to indicate whether the receptacle has been previously opened.

10 After opening, the opening may be arranged to be closed by a closure means.

The opening may be arranged to have any desired cross-section, for example circular or star-shaped. The  
15 opening may have a maximum diameter of at least 1 cm, preferably at least 1.5 cm and, more preferably at least 2 cm. The area of the opening may be at least 2 cm<sup>2</sup>, preferably at least 3 cm<sup>2</sup> and, more preferably, at least 4 cm<sup>2</sup>.

20 The receptacle may have a volume of at least 0.5 litres, preferably of at least 1 litre. The volume is preferably less than 5 litres and, more preferably less than 3 litres.

25 The foodstuff may be adapted to be sufficiently fluid at -12°C, preferably at -15°C, more preferably at -18°C, such that it can be dispensed from a said opening in said receptacle by manual application of a force.

30 Said foodstuff may be such that, at a temperature in the range -16°C to -18°C, a probe can be inserted therein at a rate of 1mm/sec using a pressure of less than 1000 Pa. Preferably, the pressure used may be less than

800 Pa. More preferably, the pressure used may be less than 600 Pa.

Said foodstuff is suitably arranged to be extruded  
5 from a said opening.

The foodstuff may start to freeze at a temperature of less than  $-5^{\circ}\text{C}$ , preferably less than  $-8^{\circ}\text{C}$ , more preferably less than  $-11^{\circ}\text{C}$ .

10

Where the foodstuff is ice-cream, said ice-cream may include 2 - 20 wt% fat, 2 - 10 wt% sucrose or other sweetening agent, 5 - 20 wt% milk solids, 10 to 80 wt% water and 1 - 15 wt% of a freezing point depression  
15 compound. Said freezing point depression compound may comprise further sucrose or another sugar, or may comprise another edible compound adapted to lower the freezing point. Preferred freezing point depression compounds include polyols, for example glycerol. The ice-cream may  
20 include more than 2 wt%, preferably more than 4 wt%, more preferably more than 5 wt%, of a polyol, for example glycerol. Especially preferred is the case wherein the ice-cream includes more than 6 wt% of a polyol, for example glycerol.

25

The receptacle and the product are advantageously arranged so that the product can be subjected to ambient temperature for a reasonable time, with minimum detriment to the foodstuff. With prior art products, there is a risk  
30 that the foodstuff may melt after a short time, for example 15 minutes at ambient temperature (e.g.  $25^{\circ}\text{C}$ ). When such a melted foodstuff is re-frozen, its quality is impaired due to the growth of large ice crystals. Suitably, the product of the present invention can be  
35 subjected to ambient temperature for a period of at least

30 minutes, preferably 45 minutes, more preferably 60 minutes, without any significant amount of large crystal growth or other detrimental effects when the product is replaced in a freezer.

5

The invention extends to a foodstuff per se, the foodstuff being adapted to be sufficiently fluid at a temperature of  $-10^{\circ}\text{C}$  such that it can be dispensed from an opening by manual application of a force.

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The foodstuff may be as described in any statement herein.

The invention extends to a receptacle for a foodstuff  
15 per se.

The invention extends to a method of packaging a foodstuff which is adapted to be sufficiently fluid at a temperature of  $-10^{\circ}\text{C}$  such that it can be dispensed from an  
20 opening in a receptacle by manual application of a force, the method comprising providing said foodstuff in a receptacle arranged to define an opening for the dispense of the foodstuff.

25 The invention extends to a method of dispensing a foodstuff at a temperature of less than  $-10^{\circ}\text{C}$ , the method comprising causing the foodstuff in a fluidic state to pass out of an opening in a receptacle in which the foodstuff is contained by the manual application of a  
30 force by an operator.

The force may be applied by the operator directly contacting the receptacle, for example in order to cause the receptacle to be compressed to apply said force.

35

Any feature of any aspect of any invention described herein may be combined with any feature of any other aspect of any invention described herein.

5        Specific embodiments of the present invention will now be described, by way of example, with reference to the accompanying diagrammatic drawings, in which:

10        Figure 1 is a front view of a dispensing bag;

Figure 2 is a front view of another dispensing bag;

15        Figure 3 is a cross-section along line III-III of figure 1;

Figure 4 is a detailed cross-section of the walls of the arrangement shown in figure 3 (not to scale).

20        In the figures, the same or similar parts are annotated with the same reference numerals.

An ice-cream is made up according to the following formulation:

		wt%
25	Fat (hydrogenated kernel oil)	6
	Sucrose	5
	Glycerol	7
	Emulsifier/Stabiliser	0.6
	Skimmed Milk Powder	12.1
30		wt%
	Flavour	as required
	Colour	as required
	Water	to 100%

The ice-cream is found to start to freeze at a temperature of about  $-14^{\circ}\text{C}$ . Consequently, even after a period in a domestic refrigerator at about  $-18^{\circ}\text{C} \pm 2^{\circ}\text{C}$ , the ice-cream is still relatively soft and flowable. (It  
5 should be noted that conventional "soft-serve" ice-cream of the type described herein would be relatively solid and non-flowable at  $-18^{\circ}\text{C}$ ).

Tests on the fluidity of the ice-cream have shown  
10 that, at a temperature in the range  $-16^{\circ}\text{C} - 18^{\circ}\text{C}$ , a probe can be inserted into the ice-cream at a rate of 1mm/sec using a pressure of about 400 Pa.

The lowering of the freezing point of the ice-cream  
15 is achieved by increasing the amount of glycerol in the formulation to 7 wt% as shown above. This compares with the 0 - 2 wt% found in conventional soft-serve ice-cream. It may be possible to use other ingredients to lower the freezing point to the desired level.

20

The ice cream is provided in a bag 2 or 3 shown in figures 1 to 4.

Referring to figures 1 to 3, bag 2 comprises first  
25 and second superimposed walls 4, 6 made out of sheets of material. The walls are heat sealed together along edges 8, 10, 12 to define a receptacle for the ice-cream. A hole 14 of about 2.5 cm maximum diameter is cut between walls 8, 12 and is arranged to cooperate with a nozzle  
30 arrangement 16 which can be fixed to walls 4, 6. The nozzle arrangement may have any desired cross-section, for example it may be circular or star-shaped. A cap (not shown) is provided for closing the nozzle.

Referring to figure 4, walls 4, 6 are of laminate construction and include: an inner layer 18 having a thickness of about 50  $\mu$ m and being made out of a metallized flexible food grade polymeric sheet material, for example low density polythene; a middle layer 20 having a thickness of 2-3 mm and being made of a high density flexible foam material; and an outer layer 22 having a thickness of about 50  $\mu$ m and being made out of a metallized flexible food grade polymeric sheet material, for example low density polythene.

As shown in the figure, the foam layer 20 is compressed in the region 10 of the heat seal so that adjacent layers of the walls make intimate face-to-face contact. However, inwards of the heat seal towards the container portion of the bag, the foam layer 20 is expanded and is not in contact with outer layer 22. In fact, an air gap is defined between the two layers during manufacture. The air gap provides a heat insulating layer in conjunction with the foam layer 20. The inner layer 18 may simply abut the foam layer 20 or be heat sealed or otherwise bonded thereto.

The bag 2 may be machine filled with ice-cream at its point of manufacture either via opening 14, prior to securing of nozzle 16 in position or via an opening between walls 4, 6 along edge 10, prior to the walls 4, 6 being heat sealed together along this edge.

The bag including the ice-cream may be stored in a domestic refrigerator at about  $-18^{\circ}\text{C}$ .

When it is desired to dispense ice-cream, the cap (not shown) is removed from the nozzle and the ice-cream is then caused to be extruded via the nozzle. This can be

achieved manually (because the ice-cream is sufficiently soft) by a user squeezing the bag, suitably from its upper end 20. It should be noted that no mechanical means of causing ice-cream to be extruded is required. The force to extrude the ice-cream can readily be provided by a person. Extruded ice-cream has the cross-section of the opening, for example it may be circular or star-shaped. It may be directed from the bag onto an ice-cream cone in the same way as in the known ice-cream dispensing machine described above.

After ice-cream has been dispensed, the nozzle may be released by the cap.

The bag may have any convenient volume. It may be arranged to contain at least one litre of ice-cream. Two litre bags may also be provided.

Bag 3 is the same in construction as bag 2 but its shape is different. Bag 3 is generally cylindrical but tapers inwardly towards nozzle arrangement 16. It may be manufactured and used as described above for bag 2.

It should now be appreciated that the provision of a bag 2 including ice-cream formulated as described may advantageously allow soft-serve ice-cream to be provided and dispensed immediately after it has been removed from a refrigerator at about  $-18^{\circ}\text{C}$ . It is found that, advantageously, the bag can easily be manipulated to dispense the ice-cream; it feels relatively warm to a user; and melting of the ice-cream whilst out of the refrigerator and/or during dispense is sufficiently low.

The reader's attention is directed to all papers and documents which are filed concurrently with or previous to

this specification in connection with this application and which are open to public inspection with this specification, and the contents of all such papers and documents are incorporated herein by reference.

5

All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive.

Each feature disclosed in this specification (including any accompanying claims, abstract and drawings), may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is one example only of a generic series of equivalent or similar features.

20

The invention is not restricted to the details of the foregoing embodiment(s). The invention extends to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.

25

**CLAIMS**

1. A packaged food product comprising:
  - 5 a flexible receptacle having a wall which includes first and second layers of flexible material, with an air gap being defined between said layers; and
  - 10 a foodstuff within the receptacle, wherein the foodstuff is adapted to be sufficiently fluid at a temperature of less than 10°C such that it can be dispensed from an opening in said receptacle by manual application of a force.
- 15 2. A product according to Claim 1, wherein said foodstuff is ice-cream.
3. A product according to Claim 1 or Claim 2, wherein said foodstuff is arranged to be dispensed by a user  
20 causing the receptacle to be compressed.
4. A product according to any preceding claim, wherein said first and second layers comprise plastics material in sheet form.
- 25 5. A product according to any preceding claim, wherein said first layer contacts the foodstuff in the receptacle and is a food grade polymeric material.
- 30 6. A product according to any preceding claim, wherein said second layer is an outermost layer of the receptacle.
7. A product according to Claim 6, wherein said outer layer includes heat reflecting means for reflecting heat

outside the receptacle away from the foodstuff within the receptacle.

5 8. A product according to any preceding claim, wherein said air gap between said first and second layers includes entrapped air therewithin.

10 9. A product according to any preceding claim, wherein said wall incorporates a foam material between said first and second layers.

10. A product according to Claim 9, wherein the foam material contacts said first layer.

15 11. A product according to Claim 9 or Claim 10, wherein said foam material is spaced from said second layer by means of said air gap.

20 12. A product according to any preceding claim, wherein said receptacle comprises first and second walls having any characteristic of said wall as described in any preceding claim.

25 13. A product according to Claim 12, wherein said walls are heat sealed to one another.

30 14. A product according to Claim 13, wherein in said sealed regions of said wall or walls, a reduced or no air gap is defined between said first and second layers of respective walls.

15. A product according to any preceding claim, wherein said receptacle is non-self-supporting.

16. A product according to any preceding claim, wherein said foodstuff is such that, at a temperature in the range -16°C to -18°C, a probe can be inserted thereinto at a rate of 1 mm per second using a pressure of less than 1,000 Pa.
- 5
17. A product according to any preceding claim, wherein said foodstuff starts to freeze at a temperature of less than -5°C.
- 10
18. A product according to any of Claims 3 to 17 when dependent upon Claim 2, wherein said foodstuff includes 2 to 20 wt% fat, 2 to 10 wt% sucrose or other sweetening agent, 5 to 20 wt% milk solids, 10 to 80 wt% water and 1 to 15 wt% of a freezing point depression compound.
- 15
19. A product according to Claim 18, wherein said freezing point depression compound comprises further sucrose or another sugar, or may comprise another edible compound adapted to lower the freezing point.
- 20
20. A product according to Claim 18 or Claim 19, wherein said freezing point depression compound is a polyol.
21. A product according to Claim 20, wherein said polyol
- 25 is glycerol.
22. A product according to Claim 20 or Claim 21 which includes more than 4 wt% of said polyol.
- 30
23. A foodstuff adapted to be sufficiently fluid at a temperature of -10°C such that it can be dispensed from an opening by manual application of a force per se.
24. A receptacle for a foodstuff as described herein per
- 35 se.

25. A method of packaging a foodstuff which is adapted to be sufficiently fluid at a temperature of  $-10^{\circ}\text{C}$  such that it can be dispensed from an opening in a receptacle by manual application of a force, the method comprising  
5 providing said foodstuff in a receptacle arranged to define an opening for the dispense of the foodstuff.

26. A method of dispensing a foodstuff at a temperature of less than  $-10^{\circ}\text{C}$ , the method comprising causing the  
10 foodstuff in a fluidic state to pass out of an opening in a receptacle in which the foodstuff is contained by the manual application of a force.

27. A product substantially as hereinbefore described  
15 with reference to the accompanying diagrammatic drawings.

28. A foodstuff substantially as hereinbefore described with reference to the accompanying diagrammatic drawings.

20 29. A receptacle substantially as hereinbefore described with reference to the accompanying diagrammatic drawings.



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Claims searched: 1-23,25-28

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**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): A2B ( BMF2, BMF9, BMF12, BMF19 ); B8C ( CWA1 )

Int Cl (Ed.6): A23G 9/02, B65D 85/78

Other:

**Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
X	GB 2019187 A ( UNILEVER ) see page 1 lines 48-52 & Examples	23
X	GB 1517912 ( UNILEVER ) see page 2 lines 45-62, Example 1 & page 4 lines 1-14	23
X	EP 0220836 A2 ( GENERAL FOODS ) see page 2 line 32 to page 3 line 5	1,23
X	US 4574987 ( HALLIGAN ) see whole document	1-3,5,6,8, 12-14,17, 23,25,26
X	US 4421778 ( KAHN ) see column 1 lines 52-61	23
X	US 4374154 ( COLE ) see column 1 lines 46-51 & column 3 lines 32-37	1,23,25,26
X	US 4346120 ( MORLEY ) see column 1 lines 57-59 & column 3 lines 52-65	1,23,25,26
X	US 4333954 ( TRZECIESKI ) see column 1 lines 27-32 & Example 1	23
X	US 4146652 ( KAHN ) see Example 20	1,23,25,26

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	F	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.



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(54) **Aerosol system for cream or an aerated dessert**

(57) The invention relates to an aerosol system for preparing spray cream or an aerated dessert. The aerosol system according to the invention comprises an aerosol can having at least two compartments (A) and (B), which compartments are gastightly separated from each other by an at least partially movable wall, compartment (A) containing a propellant and compartment (B) containing a cream or dessert composition comprising a blowing agent which is at least partially incorporated into said cream composition, compartment (B) being provided with a metering valve. With the aerosol system according to the invention, a spray cream can be obtained which, in respect of firmness, stability and mouth feel, bears a strong resemblance to genuine whipping cream. Moreover, the aerosol system according to the invention has a high spraying percentage. During spraying of the spray cream in the aerosol system according to the invention, this cream does not sputter.

## Description

[0001] The invention relates to an aerosol system for metering cream or an aerated dessert and the like.

[0002] Aerosol systems for dispensing whipping cream or a product resembling whipped cream, which product will in this specification and the appended claims be further referred to as "spray cream", such as they are commercially available, are characterized by a can filled with a cream composition and a gas. The function of this gas is twofold. On the one hand, it functions as a propellant; on the other, it functions as a blowing agent. The blowing agent dissolves at least partially in the cream composition. Because the blowing agent and the cream composition are present in the aerosol can under raised pressure, the propellant will, when the product is being sprayed, expand, so that bubbles will grow in the cream composition in which it has dissolved, which results in an "aerated" product.

[0003] The amount of gas that is dissolved in the cream composition is - in combination with the pressure in the aerosol can - determinative for the so-called overrun. By "overrun" is meant the relative increase of volume of the sprayed product compared with the volume of the cream composition in the aerosol can. An overrun of 100% corresponds to an increase of volume by a factor two.

[0004] The twofold function of the gas present in conventional aerosol cans for spray cream entails a number of drawbacks. For instance, the initial pressure of the propellant must be sufficiently high to enable emptying the aerosol can sufficiently. On the other hand, this pressure must not be too high, because in that case, the product will sputter badly, certainly at the first meterings.

[0005] Moreover, an unduly high pressure of the blowing agent involves the solution of a relatively large amount of the propellant in the cream composition present in the aerosol can, resulting in an overrun which is unacceptably high. Thus, the desired mouth feel is lost.

[0006] In addition, the overrun of the cream composition to be metered strongly depends on the remaining amount of gas in the aerosol can. The overrun is far from constant and can change, and in particular decrease, during the period of use of the aerosol can.

[0007] In the prior art, it has been proposed to overcome a number of the problems outlined by using a gas mixture consisting of two types of gas having different functions. One type comprises a gas which dissolves poorly, if at all, in the product and substantially fulfills the propelling function (the propellant constituent), the other type dissolves in the product and should guarantee the desired overrun (the blowing agent constituent). Such information can, for instance, be found in European patent application 0 747 301, in which, moreover, cream compositions are mentioned that are suitable for use in the present invention. For this reason, for the descrip-

tion of suitable cream compositions, said document is incorporated in the present specification by reference.

[0008] Also if a gas mixture consisting of several constituents is used, the total initial pressure (i.e., the pressure in the aerosol can before use) should not be too high, because this may cause an unduly fast outflow of the product during spraying, which may inter alia be accompanied by sputtering and may lead to an unstable or otherwise unacceptable product. As a matter of fact, for safety reasons, the maximally allowable pressure in aerosol cans is moreover limited to 12 bar at a temperature of 50°C.

[0009] For the above reasons, the initial pressure in the aerosol can cannot be too high.

[0010] However, too low an initial pressure in aerosol cans for spray cream has the drawback that a portion of the cream cannot be sprayed. Due to the spraying of the product, the pressure in the aerosol can drops and is eventually not high enough to empty the aerosol can completely, or at least to an economically suitable amount. This last aspect is expressed in the spraying percentage, defined as the weight of all the sprayed product relative to the original weight of the cream composition in the can before spraying. A spraying percentage of 100% corresponds to a completely emptied can. However, spraying percentages of at least 95%, preferably at least 97%, yet most preferably more than 98% would already mean a great step forwards for spray cream and aerated desserts.

[0011] As follows from Comparative Example 6 below, a conventional aerosol system with a low-viscosity filling already yields residual percentages of more than 5%.

[0012] Moreover, also when gas mixtures in conventional types of aerosol cans are applied, during use, the amount of blowing agent decreases with the total pressure in the aerosol can, so that the overrun of the sprayed product will change during the period of use.

[0013] As stated, in conventional aerosol systems, it is not properly possible to obtain a sufficiently high spraying percentage with genuine whipping cream. By "genuine whipping cream" is meant a cream which can be entirely prepared from milk constituents.

[0014] Whole milk consists for 90 wt.% of skimmed milk and for 10 wt.% of cream. By for instance centrifuging, the cream fraction can be separated from the skimmed milk, possibly with a portion of non-fat milk, and after that be used, inter alia, for the preparation of whipping cream. Whipping cream has a fat content of at least 36 wt.%. This fat is termed "milk fat".

[0015] The firmness of genuine whipping cream results from the so-called "buttering" of the cream. For obtaining the desired firmness, a certain degree of buttering is required. When whipping cream is whipped manually or by mixer, or in other foaming systems intended for whipping, there is time to form a stable system through the buildup of a crystal network. In the case of whipping cream, the formation of that crystal network

is referred to as "buttering". However, the degree of buttering required for genuine whipping cream results in a composition which is too firm for being sprayed to a sufficient degree in a conventional aerosol can. Consequently, the conventional can filled with this cream composition cannot be sprayed out or only to an insufficient degree, in other words: the spraying percentage is too low. To overcome this problem, the cream composition in a conventional can should undergo treatments or modifications in composition, for instance by supplying additives, which are so drastic that it is often no longer possible to speak of a genuine whipping cream.

[0016] Generally, with conventional aerosol cans, it has not proved to be possible to spray out cream compositions or aerated desserts with on the one hand a sufficiently high spraying percentage (influenced by, inter alia, the viscosity of the cream composition, dimensions of the spray nozzle, (initial) pressure of the propellant, presence of other additives), and on the other a stand, form and mouth feel of the product (in addition to the above-mentioned factors co-determined by, for instance, the amount of blowing agent) which is comparable with a mechanically whipped cream.

[0017] Spray cream obtained from conventional aerosol cans differs, and often even to a high degree, from "genuine" whipped whipping cream.

[0018] Here, by "genuine whipped whipping cream" is meant whipping cream which is, for instance, whipped by a rod or by a(n electric) mixer, but also whipping cream from an automatic whipping apparatus, such as, for instance, a Sanomat® cream whipping apparatus or a Hobart® planetary mixer.

[0019] In more detail, in conventional aerosol cans, in view of the problems involved in the spraying of genuine whipping cream, there is often used a product which resembles whipping cream to a higher or lesser degree, for instance a so-called topping. Usually, such a topping is composed on the basis of proteins and contains, in addition, for instance coco fat and emulsifiers. For use in conventional aerosol cans, recombined cream products are used as well. In a recombined cream, the animal fats have been (partially) replaced by vegetable fats, for instance in order to increase the spraying percentage. Usually, the taste and/or mouth feel of such products cannot stand comparison with whipping cream.

[0020] One of the objects of the present invention is to provide an aerosol system which can spray whipping cream which, as far as firmness, stand, overrun and mouth feel are concerned, is comparable with genuine whipping cream. As genuine whipping cream, the whipping cream obtained with a Sanomat® whipping cream apparatus is referred to in this specification and the appended claims.

[0021] An important cause for the deviant mouth feel of known spray creams obtained from conventional aerosol cans is that the overrun of the product from the conventional aerosol can is (too) high; this overrun is

approximately 400-600%. This is caused by the amounts of blowing agent/propellant in the conventional aerosol can, which amounts should be large enough to enable emptying the aerosol can to an acceptable degree. The increase of the contribution of insoluble propellant in the combination blowing agent/propellant may have the undesired consequence that the can loses the propellant easily, while no product is being sprayed, for instance due to improper handling of the can. In addition, there remains the problem that during use, the pressure of the combination blowing agent/propellant decreases, causing the overrun of the product, depending on the can content, to change, and in particular decrease, substantially during use, which is undesirable.

[0022] Because of their composition, the toppings and recombined cream compositions mentioned are often not stable; they sag within a few minutes: the so-called "stand" of the product is little acceptable. For toppings and recombined cream compositions sprayed by conventional aerosol cans, at a period longer than, for instance, half an hour at room temperature, the stand is generally insufficient.

[0023] According to the invention, the problems outlined can be solved and an improved whipped cream or product resembling whipped cream or an aerated dessert can be metered from an aerosol system. It has been found that the above problems are solved by an aerosol system with spray cream or an aerated dessert, comprising an aerosol can having at least two compartments (A) and (B), which compartments are gastightly separated from each other by an at least partially movable wall, while in compartment (A) a propellant is present and in compartment (B) a cream or dessert composition is present comprising a blowing agent which is at least partially incorporated into said cream composition, compartment (B) being provided with a metering valve.

[0024] With the aerosol system according to the invention, a spray cream product or aerated dessert can be obtained which, as far as firmness, stability and mouth feel are concerned, bears strong resemblance to genuine whipped cream (such as, for instance, obtained with a Sanomat® apparatus). Moreover, the aerosol system according to the invention has a high spraying percentage. During spraying of the spray cream with the aerosol system according to invention, the cream does not sputter.

[0025] Apart from obtaining whipped cream or a product resembling whipped cream, the aerosol system according to the invention can very suitably be used for products which, as far as consistency is concerned, are comparable with whipped cream but which are different in taste, for instance particular types of desserts. Thus, according to the invention, it is possible to add, for instance, fragrances, coloring and/or flavoring substances to the cream composition in the can, without changing the essence of the invention. In this manner,

airy desserts can for instance be made very well, by supplying the suitable additives, such as an aroma, to a cream composition. Hence, wherever "spray cream", "whipped cream" and "the product" are mentioned in this text, it should also be understood to include such airy dessert. Generally, "spray cream" or "cream composition" refers to the composition in the aerosol can and "whipped cream" refers to the sprayed product.

[0026] In addition, according to the invention, a product is obtained whose overrun of the first meterings relative to the last meterings is substantially constant.

[0027] As a matter of fact, aerosol systems comprising two compartments are known per se. For instance, US Patent 4,685,597 teaches an aerosol can in which the product-containing compartment is separate from the propellant-containing compartment. However, no products are described that involve the problems pertaining to a whipping cream, a product resembling whipping cream or an airy dessert: the aerating or gassing during metering, with the product having a consistency other than in the bottle, in particular due to the overrun, but being nevertheless stable. In view of this, it is observed that in the US patent, reference is made to cream that is already whipped and may be present as filling.

[0028] Further, US Patent 3,896,970 teaches an aerosol system in which a propellant-containing product is in fact metered. However, the products to be metered are cosmetic oil-in-water emulsions such as hair-coloring foams, which do not involve the problems pertaining to a cream or airy dessert product which requires a considerably longer stability obtained through the formation of a crystal network.

[0029] As stated, the aerosol system according to the invention is particularly suitable for obtaining a product resembling genuine whipping cream. To improve the properties in respect of the spraying percentage and overrun, it has moreover been found that a destabilizing step - which is in fact customary for cream to be whipped in a conventional manner - applied to the cream composition with which a can is filled up in the aerosol system according to the invention, leads to very good results. Without wishing to be bound to any theory, the stiffening of whipping cream is based upon a mechanism wherein the membranes around the fat globules that are present in the cream composition become slightly damaged through whipping or shearing stresses applied otherwise. As a result, the globules will start to coalesce. This process is referred to as "buttering". Moreover, through whipping or spraying, air or another gas is driven into the cream. These gas bubbles are stabilized by a layer of fat and/or a protein layer on the outside. This imparts the desired firmness to the whipping cream. The other properties, such as mouth feel, are closely related to the amount of gas present in the whipping cream and, in aerosol cans, are determined to a significant extent by the overrun. By destabilizing the cream in the aerosol can, according to the invention, it

is possible to impart already some degree of buttering to the product in the aerosol can, at least the cream can already be slightly activated, to the effect that as a result of the spraying operation, the shearing stresses provided through spraying impart precisely the right degree of buttering to the cream composition, to obtain a product having a desired overrun and a high spraying percentage of more than 95%, preferably more than 97% and most preferably more than 98%.

[0030] Whereas in conventional aerosol cans, the product to be metered leads to a spraying percentage of over 90% only at viscosities below 300 cP, the use of the aerosol system according to the invention enables metering recipes whose viscosity may also range between 300 and about 2000 cP.

[0031] Although buttering plays an important part in the aerosol systems according to the invention, it is not properly possible, as a skilled person knows, to lay down the buttering degree or the degree of destabilization in a number or to objectify it otherwise. For this reason, a suitable buttering degree and a suitable degree of destabilization are defined on the basis of the desired product properties. After that, with the possibilities available and partly in the light of the following description and Examples, it is within the scope of a skilled person to generate suitable cream compositions.

[0032] By setting the correct buttering degree through destabilization of the cream composition in the aerosol can, it is possible to obtain a product which can be sprayed for at least 95%, preferably at least 97%, and most preferably at least 98%, to obtain a sprayed product having an overrun of at least 80% and at the most approximately 300% and a good mouth feel.

[0033] The destabilization should not be carried out too far, because otherwise the buttering advances too far, as a result of which the product becomes too stiff and can no longer be sprayed properly.

[0034] An overrun of at least 80% is needed to obtain a good mouth feel. On the other hand, the overrun should not be much higher than 300%, preferably not higher than 200%, because the product will then become too airy, which is also at the expense of the mouth feel, at least when a product resembling whipping cream is aimed at. By selecting a suitable degree of destabilization, the buttering degree can be set so that at a suitable combination of on the one hand amount and type of blowing agent, and on the other factors such as embodiment of the aerosol can and dimensions of, for instance, the nozzle, a cream product having the desired overrun, a good stand and a good mouth feel can be obtained.

[0035] By "good mouth feel" is meant a mouth feel which is comparable with the mouth feel of whipping cream obtained by the above-mentioned Sanomat<sup>®</sup> cream whipping apparatus.

[0036] As mentioned, by setting the proper buttering degree or, in other words, by sufficiently activating the cream composition through destabilization of the

cream composition in the aerosol can, it is moreover possible to obtain a product which maintains a good stand for half an hour at atmospheric pressure and at a temperature of about 4-8°C and exhibits a slight serum loss after half an hour.

[0037] The destabilization should be performed so that the buttering degree is such that when the sprayed blob of whipping cream is stored in a refrigerator, i.e. at a temperature which is normally about 4-8°C, it has not sagged visibly after half an hour.

[0038] The serum or milk serum is the aqueous phase in the product. Separation thereof causes an undesired gloss on the product. By "slight serum loss" is meant that after half an hour, the sprayed blob of cream still does not exhibit any serum separation.

[0039] Preferably, the wall mentioned between the compartments (A) and (B) is a piston, or is formed by a flexible and/or elastic diaphragm.

[0040] A practical embodiment of the aerosol system according to the invention is, for instance, an aerosol can of the so-called bag-in-can type, wherein compartment (A) is partly formed by the space enclosed by a bag, also referred to as pouch. Such a pouch is manufactured from flexible and/or elastic material, for instance a laminate, the outside of which consists, for instance, of PET, with a layer of aluminum therebelow, with a subjacent layer of nylon on a polypropylene sub-layer.

[0041] Another practical embodiment of the bag-in-can type is the embodiment wherein compartment (A) is partly formed by the space enclosed by the wall of the aerosol can and compartment (B) is partly formed by the space enclosed by a pouch.

[0042] A third possible practical embodiment is an aerosol system of the so-called piston type wherein compartment (A) is formed by the space enclosed by the wall of the aerosol can and one side of said piston.

[0043] The blowing agent in compartment (B) should be at least partially soluble in the cream composition. Suitable blowing agents comprise CO<sub>2</sub>, N<sub>2</sub>O or mixtures thereof, possibly in combination with air and/or N<sub>2</sub>.

[0044] To all embodiments, it applies that through the use of the aerosol system according to the invention, the amount of blowing agent in the cream composition is and can be lower than in conventional aerosol cans. The amount of blowing agent in compartment (B) is at the most 1.5 wt.% calculated on the total amount of cream composition and preferably ranges between 0.1 and 1 wt.%.

[0045] To achieve a spraying percentage of 95% or more, which is considerably higher than is found for known aerosol systems, and to obtain the other advantages mentioned, the initial pressure in compartment (A) should be greater than 5 barg. Preferably, the initial pressure in compartment (A) is greater than 6 barg.

[0046] Apart from a high spraying percentage, the aerosol system according to the invention has the prop-

erty that the pressure of the propellant is independent of the amount of blowing agent and vice versa. The effect thus achieved is that the overrun of the sprayed product hardly changes during the period of use, i.e. a product is sprayed which is to a high degree constant in terms of composition and product properties.

[0047] In the aerosol system according to the invention, means are present for introducing the propellant into compartment (A). These means may, for instance, comprise a valve extending to the outside of the aerosol can, through which the propellant is injected.

[0048] It is also possible to generate the propellant *in situ*, for instance by carrying out a chemical reaction in compartment (A). An example of such system wherein the propellant is generated *in situ* by a chemical reaction is the so-called self-pressure-bag system. This can for instance be effected by the reaction between a carbonate salt, for instance sodium carbonate, and an acid solution, for instance citric acid solution, from which reaction CO<sub>2</sub> is obtained. In this system, the two reagents are contained in separate pieces of foil, while the foil around the carbonate salt can be dissolved by the acid solution. These pieces of foil are together located separately in the same pouch which forms compartment (A) or is provided therein. According to this system, the foil around the acid solution is broken by pressing or tearing, whereupon the pouch with the two reagents is directly transferred into the aerosol can, which is closed off from the atmosphere. Meanwhile, the citric acid solution has dissolved the soluble foil around the sodium carbonate or will do so, and enter into a reaction therewith, involving the release of CO<sub>2</sub>. Accordingly, pressure is built up. By choosing the amounts of reagents, the eventual pressure can be determined.

[0049] The cream or dessert composition (B) has preferably undergone a destabilizing treatment. Such treatment can comprise a temperature treatment, addition of a suitable stabilizer and/or addition of a suitable emulsifier. Through this treatment, the spraying properties of the product will improve.

[0050] After the atmosphere has been closed off and blowing agent has been added (gassing), the cream composition comprises at least a fat, preferably milk fat, non-fat milk constituents and a blowing agent in an amount which is at the most 1.5 wt.% of the amount of cream composition.

[0051] The fat fraction in the cream composition can consist at least partially of vegetable fats. Such recombined cream is also suitable for being sprayed with the aerosol system according to the invention. For recombined cream, suitable fats are fats which are solid at refrigerator temperature, i.e. a temperature of about 4-8°C, such as coco fat.

[0052] The properties of the spray cream obtained with the aerosol system according to the invention, which properties are improved relative to the conventional spray cream, are partly realized through the use

of an improved cream composition in the can, which cream composition is difficult or impossible to use in conventional aerosol cans. As mentioned, these improvements are realized through destabilization of a cream composition involving buttering of the cream composition. In known aerosol systems, when the cream composition is destabilized, buttering already takes place in the can, as a result of which it can no longer be emptied or only to an insufficient extent. The above is illustrated at length in the following Examples.

**[0053]** If so desired, the cream composition may also have undergone, before filling up, a pasteurizing treatment and/or a sterilizing treatment, for instance a UHT treatment.

**[0054]** The destabilization of the cream may inter alia be effected through one or more of the following measures, known per se:

- i. By adding emulsifiers to the cream composition, to promote the formation of a finer emulsion, which moreover imparts a better mouth feel to the sprayed product.
- ii. By using stabilizers which improve the mouth feel and prevent serum separation and serum loss of the sprayed product.
- iii. By adding an acid, for instance lactic acid or citric acid, the pH can be lowered, so that the firmness of the product can be controlled. Also, the optimal homogenization temperature and pressure can be adjusted through the addition of, for instance, lactic acid.
- iv. By using different vegetable and/or animal fats, the sprayed product can be rendered firmer.
- vi. By homogenizing, smaller fat globules can be obtained, so that the sprayed product has a better mouth feel. This homogenizing may take place in one or more steps, while the composition is subjected to increased pressure and/or temperature.

**[0055]** Through a combination of propellants such as  $N_2O$ ,  $CO_2$  and  $N_2$ , the overrun can be set.

**[0056]** A cream composition having a viscosity of 5 Pa.s or higher can well be sprayed by the aerosol system according to the invention.

**[0057]** Suitable stabilizers are compositions based on carrageen, for instance carrageenan, starch, xanthan gum, alginate, guar, gelatin, but other stabilizers known to a skilled person can also be used successfully in the invention.

**[0058]** Suitable emulsifiers are, for instance, mono- and diglycerides (E471) and combinations thereof. Other emulsifiers known to a skilled person can also be used successfully in the invention.

**[0059]** In addition to the above-mentioned compositions, the cream composition can further comprise one or more of the following ingredients: animal fat, vegetable fat, such as, for instance, coco fat, sugar, fragrances, coloring and/or flavoring substances.

**[0060]** The invention is hence further characterized by the use of the above-mentioned, improved cream composition in an aerosol system as described hereinabove to obtain a stable cream product which, at room temperature and atmospheric pressure, has a stand of more than 1 hour and/or an overrun of less than 300%.

**[0061]** An aerosol system according to the invention is prepared by performing the following steps:

- a) preparing a cream or dessert composition comprising at least a fat, which is preferably cream, and non-fat milk constituents, and optionally one or more suitable stabilizers and/or emulsifiers,
- b) optionally subjecting said cream composition to a temperature treatment,
- c) homogenizing said cream composition,
- d) filling one of the compartments of an aerosol can as mentioned hereinabove with an appropriate amount of the cream composition,
- e) introducing into the cream or dessert composition a blowing agent in an amount which is at the most 1.5 wt.% of the amount of cream or dessert composition,
- f) filling a compartment of said aerosol can other than the compartment mentioned with a propellant; wherein steps d) + e) and f) can be performed in random order.

**[0062]** Steps d) + e) can also be combined, for instance by injecting the cream composition under pressure of the blowing agent. The order of steps d) + e) and f) is not critical and usually depends on the type of aerosol can that is used. For instance, for preparing an aerosol system of the bag-in-can type wherein the propellant is present in the pouch, the final steps are preferably performed in the order d), e), f). For preparing an aerosol system of the bag-in-can type wherein the cream composition is present in the pouch, the final steps are preferably performed in the order f), d), e). For preparing an aerosol system of the piston type, the final steps are performed in the order d), e), f).

**[0063]** Hence, the aerosol system according to the invention can be used for obtaining a stable cream product having one or more of the following properties, measured at room temperature and atmospheric pressure: a stand of more than 1 hour, an overrun of less than 300% and/or an emptying percentage of more than 90%. Through the use of a suitable cream composition, a sprayed whipping cream can be obtained with the aerosol system according to the invention which, as far as firmness, stability and mouth feel are concerned, bears strong resemblance to genuine whipping cream as obtained from an automatic whipping apparatus.

**[0064]** The invention will now be specified on the basis of a number of Examples which are not intended to limit the invention. Wherever percentages are mentioned, these percentages are calculated on the weight of the total composition, unless indicated otherwise.

**Example 1**

[0065] A cream composition having a fat content of 40% was made from milk. To this, cream, sugar and carrageen were added, to obtain a cream composition having the following composition:

cream (40%)	80%
skimmed milk	9.92%
sugar	10%
carrageen	0.08%

[0066] Next, the cream composition was sterilized by a UHT treatment, after which the cream composition was cooled to 10°C and introduced aseptically in an appropriate amount into one of the two compartments of an aerosol can of the piston type. This compartment containing the cream composition was gassed with N<sub>2</sub>O in an amount corresponding to 3.5 g of N<sub>2</sub>O/600 ml of cream composition. Next, in the other compartment, propellant was fed to a pressure of 8 barg and the aerosol system was cooled to 5°C.

[0067] After spraying, the overrun of the spray cream was 165%. The spray cream had a full mouth feel and a very good firmness. The emptying percentage of the aerosol can was more than 90%.

**Reference Example 1**

[0068] The same cream composition as in Example 1 was transferred into a conventional aerosol can. Propellant was added until the pressure was 12 bar. The other steps proceeded as in Example 1.

[0069] The cream composition was difficult to spray. The emptying percentage was less than 60%.

**Example 2**

[0070] A cream composition having a fat content of 40% was made from milk. To this, skimmed milk was added, to lower the fat content to 25%. To this, 1.5% of starch was added. The cream composition was sterilized via UHT treatment and cooled to 70°C. After this, the cream composition was homogenized in two steps: first at 50 bar and then at 10 bar. The cream composition was then cooled to 10°C and introduced aseptically in an appropriate amount into one of the two compartments of an aerosol can of the piston type. This compartment containing the cream composition was gassed with N<sub>2</sub>O in an amount corresponding to 5 g of N<sub>2</sub>O/600 ml. Next, in the other compartment, propellant was fed to a pressure of 8 barg and the aerosol system was cooled to 5°C.

[0071] After spraying, the overrun of the spray

cream was 250%. The spray cream had a full mouth feel and a very good firmness. The emptying percentage of the aerosol can was more than 90%.

**Reference Example 2**

[0072] The same cream composition as in Example 2 was transferred into a conventional aerosol can. Propellant was added until the pressure was 12 bar. The other steps proceeded as in Example 2.

[0073] The cream composition was difficult to spray. The emptying percentage was less than 55%.

**Example 3**

[0074] A cream composition having a fat content of 15% was made by adding a mixture of milk fat and hardened coco fat to skimmed milk. To this, emulsifier (E471) and stabilizer were added, to obtain a cream composition having the following composition:

milk fat	15%
coco fat	15%
emulsifier	0.5%
stabilizer	0.015%
skimmed milk	69.485%

[0075] The cream composition was heated up to 60°C and then homogenized at 30 bar and 70°C. After this, the cream composition was sterilized via UHT treatment and cooled to 70°C. After this, the cream composition was homogenized in two steps: first at 40 bar and then at 10 bar. Next, the cream composition was cooled to 10°C and introduced aseptically in an appropriate amount into one of the two compartments of an aerosol can of the piston type. This compartment containing the cream composition was gassed with N<sub>2</sub>O in an amount corresponding to 5 g of N<sub>2</sub>O/600 ml. Next, into the other compartment, propellant was fed to a pressure of 8 barg, and the aerosol system was cooled to 5°C.

[0076] After spraying, the overrun of the spray cream was 240%. The spray cream had a very good firmness. The emptying percentage of the aerosol can was more than 90%.

**Reference Example 3**

[0077] The same cream composition as in Example 3 was transferred into a conventional aerosol can. Propellant was added until the pressure was 12 bar. The other steps proceeded as in Example 3.

[0078] At the initial pressure mentioned, the product

could not be sprayed. For spraying this product, a significantly higher pressure would be required. However, the legally established maximum pressure in the aerosol cans is 12 bar at 50°C.

#### Example 4

[0079] An airy dessert was prepared according to the composition of Example 1, with the difference that 0.5% of the cream was replaced by chocolate aroma, so that the composition was as follows:

cream (40%)	80%
skimmed milk	9.42%
chocolate aroma	0.5%
sugar	10%
carrageen	0.08%

[0080] The other steps were the same as in Example 1. After spraying, the overrun of the spray cream was 165%. The spray cream had a full mouth feel and a very good firmness. Moreover, the product had a taste which was experienced as very pleasant. The emptying percentage of the aerosol can was more than 90%.

#### Comparative Example 5

[0081] The residual percentage of a spray cream in a conventional aerosol can wherein  $N_2O$  was used as propellant and blowing agent, and in an aerosol can according to the invention wherein  $N_2O$  was present in both compartments, was determined depending on the viscosity. The viscosity was set by adding a varying amount of starch to the cream composition according to Example 1, such that viscosities of 40, 100, 250, 360, 410, 520, 840, 1050, 1200, 1600, 1800, 2150 and 3230 cP were measured. During the use of the conventional aerosol can, residual percentages were found as shown in Fig. 1. For the aerosol system according to the present invention, up to the value of 1800 cP, a residual percentage of less than 2% was found; from 2150 cP onwards, the residual percentage started to increase.

#### Claims

1. An aerosol system with spray cream or an aerated dessert, comprising an aerosol can having at least two compartments (A) and (B), said compartments being gastightly separated from each other by an at least partially movable wall, compartment (A) containing a propellant and compartment (B) containing a cream or dessert composition comprising a blowing agent which is at least partially incorpo-

rated into said cream or dessert composition, compartment (B) being provided with a metering valve.

2. An aerosol system according to claim 1, wherein said cream or dessert composition has undergone a destabilizing treatment.
3. An aerosol system according to claim 2, wherein the destabilizing treatment is carried out in such a manner that the sprayed composition has an overrun of at least 80% and less than 300%, preferably less than 200% and a good mouth feel.
4. An aerosol system according to claim 2 or 3, wherein the destabilizing treatment is carried out in such a manner that the sprayed composition maintains a good stand for half an hour at atmospheric pressure and at a temperature of approximately 4-8°C and exhibits a slight serum loss after half an hour.
5. An aerosol system according to any one of the preceding claims, wherein said wall is a piston or is formed by a flexible and/or elastic diaphragm.
6. An aerosol system according to any one of the preceding claims, wherein the amount of blowing agent in compartment (B) is at the most 1.5 wt.% calculated on the total amount of cream composition, and preferably ranges between 0.1 and 1 wt.%.
7. An aerosol system according to any one of the preceding claims, wherein the blowing agent is selected from the group consisting of  $CO_2$ ,  $N_2O$  and mixtures thereof, optionally in combination with air and/or  $N_2$ .
8. An aerosol system according to any one of the preceding claims, wherein the initial pressure in compartment (A) is at least 6 barg.
9. A method for preparing an aerosol system with spray cream or an aerated dessert, comprising the steps of:
  - a) preparing a cream or dessert composition comprising at least a fat and non-fat milk constituents, and optionally one or more suitable stabilizers and/or emulsifiers,
  - b) optionally subjecting said cream or dessert composition to a temperature treatment,
  - c) homogenizing said cream composition,
  - d) filling one of the compartments of an aerosol can as described in any one of claims 1-8 with an appropriate amount of said cream or dessert composition,
  - e) introducing into the cream or dessert composition a blowing agent in an amount which is

at the most 1.5 wt.% of the amount of cream or dessert composition,

f) filling a compartment of said aerosol can other than the compartment mentioned with a propellant;

wherein steps d) + e) and f) can be performed in random order.

10. A method according to claim 9, wherein a cream composition is used which has undergone a destabilizing treatment and which, closed off from the atmosphere, comprises at least milk fat, non-fat milk constituents and a blowing agent in an amount which is at the most 1.5 wt.% of the amount of cream composition.
11. Use of a cream composition as defined in claim 10 in an aerosol system as defined in any one of claims 1-8, for obtaining a stable cream product which at a temperature of approximately 4-8°C and atmospheric pressure has a stand of more than half an hour, an overrun of less than 300%, and preferably less than 200%, exhibits a slight serum loss after half an hour, has a good mouth feel and the spraying percentage being more than 95%.

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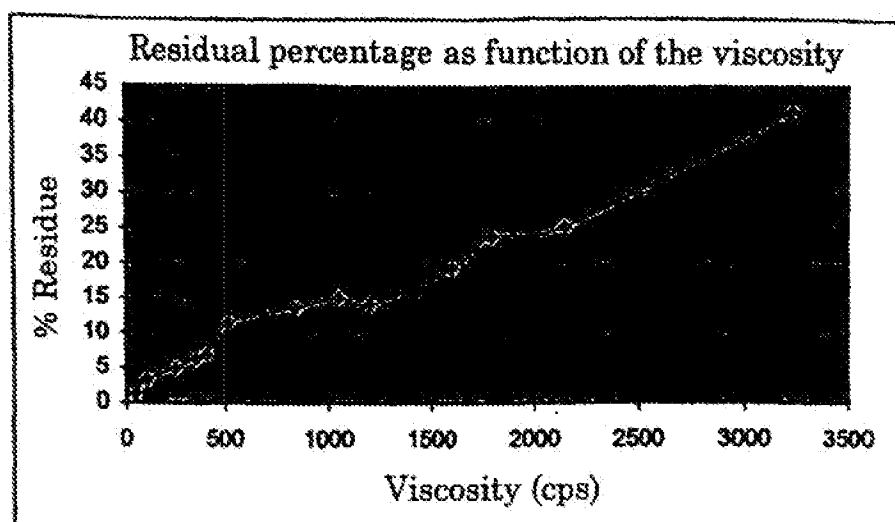
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FIG. 1





European Patent  
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# EUROPEAN SEARCH REPORT

Application Number  
EP 00 20 2121

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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Place of search THE HAGUE		Date of completion of the search 22 September 2000	Examiner Pernice, C
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EP0 FORM 1500-03/02 (P)AC(01)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
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EP 00 20 2121

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1) Family number: 90107 (GB1196286A)

© PatBase

**Title:** Foodmix

**Abstract:** Source: GB1196286A 1,196,286. Ice cream. D. WEINSTEIN. 23 June, 1967 [24 June, 1966; 25 Oct., 1966], No. 29163/67. Heading A2B. [Also in Division C4] A food mix, being a substantially homogeneous aqueous suspension containing the components of ice cream, ice milk, or sherbert, is packaged in an aerosol dispenser under the pressure of a gaseous propellant partially dissolved in the mix, the solids content of the mix consisting essentially of edible fat, non-fat milk solids, a sweetener, and one or more emulsifying, stabilizing, thickening, or flavouring agents, the total solids contents of the ice cream, ice milk or sherbert mixes being respectively 43-54 percent, 37-47 percent, and 42-59 percent, the gas being dissolved in the mix to such a degree that on discharge in chilled condition from the container the mix is whipped by the expanding and escaping gas to an over-run of, in the case of ice cream and ice milk, at least 160 percent, and in the case of sherbert, at least 80 percent, to yield an expanded mass which can be frozen to an ice cream, ice milk, or sherbert. Suitable propellant gases include monochlor pentafluoro ethane, octafluoro cyclobutane, nitrous oxide, and carbon dioxide.

**Classifications:****International (IPC 8-9):** A23G9/04 A23G9/20 A23G9/32 A23G9/44 A23G9/46

A23G9/50 (Advanced/Invention);

A23G9/04 A23G9/32 A23G9/44 (Core/Invention)

**International (IPC 1-7):** A23G5/00 A23G5/02 A23G9/00 A23G9/20 B65D83/14 F25C7/02**European:** A23G9/02 A23G9/02+D A23G9/02+H A23G9/02+H2 A23G9/02+H4D A23G9/04D A23G9/20 A23G9/32 A23G9/44 A23G9/46 A23G9/50D**Family:**

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**Priority:**

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**Assignee(s):** (std): WEINSTEIN D ; WEINSTEIN DAVID ; WEINSTEIN

**Assignee(s):** DAVID WEINSTEIN

**Inventor(s):** (std): DAVID WEINSTEIN ; WEINSTEIN D ; WEINSTEIN DAVID

1-1 of 1



SCHWEIZERISCHE EIDGENOSSENSCHAFT

EIDGENÖSSISCHES AMT FÜR GEISTIGES EIGENTUM

Internationale Klassifikation: **A 23 g 5/00**  
**F 25 c 7/02**

Gesuchsnummer: 9006/67

Anmeldungsdatum: 26. Juni 1967, 17 Uhr

Prioritäten: USA, 24. Juni und  
25. Oktober 1966 (560260, 589225)

Patent erteilt: 31. August 1971

Patentschrift veröffentlicht: 15. Oktober 1971

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## HAUPTPATENT

David Weinstein, Baltimore (Md., USA)

### Verfahren zur Herstellung einer zur Speiseeiserzeugung verwendbaren Masse und Vorrichtung zur Durchführung dieses Verfahrens

David Weinstein, Baltimore (Md., USA), ist als Erfinder genannt worden

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Die vorliegende Erfindung betrifft ein Verfahren zur Herstellung einer zur Speiseeiserzeugung verwendbaren weichen, formbeibehaltenden geschlagenen Masse unter Verwendung einer wäßrigen Mischung als Ausgangsmaterial und eine Vorrichtung, insbesondere einen Aerosolbehälter, zur Durchführung dieses Verfahrens.

Gegenstand der Erfindung ist ein Verfahren zur Herstellung einer zur Speiseeiserzeugung verwendbaren weichen, formbeibehaltenden geschlagenen Masse unter Verwendung einer wäßrigen Mischung als Ausgangsmaterial, das sich dadurch auszeichnet, daß die Feststoffe enthaltende wäßrige Mischung in einen mit einem Ventil ausgestatteten Behälter eingebracht wird, wobei der Behälter durch ein in der Mischung lösbares Gas unter Druck gestellt wird und die Menge der gesamten Festsubstanz in der Mischung so eingestellt wird, daß beim Öffnen des Ventils die Mischung durch das Ausströmen des sich in der Atmosphäre ausbreitenden Gases in aufgeschlagener Form aus dem Behälter freigesetzt wird, wobei durch das Aufschlagen das Volumen der Mischung mindestens um 200 %, bezogen auf die nicht aufgeschlagene Mischung, vergrößert wird.

Ferner betrifft die Erfindung eine Vorrichtung zur Durchführung des erfindungsgemäßen Verfahrens, die dadurch gekennzeichnet ist, daß sie einen mit einem Ventil versehenen Druckbehälter, in dem sich die wäßrige Mischung und das Druckgas befindet, aufweist.

Das erfindungsgemäße Verfahren ermöglicht die sofortige Herstellung einer weichen, formhaltenden geschlagenen Masse, aus der verwendeten wäßrigen Mischung, wobei die geschlagene Mischung beim Frisieren ein Produkt ergibt, das bezüglich Konsistenz, Struktur und die Schmackhaftigkeit der konventionell erzeugten Eiskrems, Milcheis und Gefrorenem gleichkommt oder sie übertrifft, und ein vergrößertes Volumen und ein geringeres spezifisches Gewicht als entsprechende bisher bekannte Produkte aufweist.

Das erfindungsgemäße Verfahren ermöglicht es also, weiche Süßspeisen in einer höchst praktischen, schnellen

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und sparsamen Weise zu erzeugen, wobei die Süßspeisen beim Einfrieren Produkte wünschenswerter Festigkeit, gepaart mit Schmiegsamkeit der Struktur hervorbringen, soweit es sich um Eiskrem und Milcheis handelt, sowie auch angenehmen Geschmack, Aroma und Kaugbarkeit. Die Produkte weisen einen verringerten Kaloriengehalt im Volumen auf und sind gleichzeitig frei von Defekten, die man im allgemeinen in konventionellen Eiskrems, Milcheis und Gefrorenem findet, und die man logischerweise in sogar höherem Ausmaß von meinen Zusammenstellungen und deren Abweichungen von bekannten Mischungen hätte erwarten können.

Die Erfindung wird zunächst in Verbindung mit der Herstellung und den Eigenschaften meiner neuen Eiskremmischungen und deren Einbringen in Druckbehälter und die Umwandlung in geschlagene, weiche und gefrorene Süßspeisen beschrieben werden; die erforderlichen Varianten für Milcheis- und Gefrorenemischungen werden nachher geschildert werden.

Eine Eiskremmischung muß einer großen Anzahl von Anforderungen entsprechen, um die Gunst der Kunden zu erwerben; sie muß gesetzlichen Ansprüchen Genüge leisten, und stellt eine Mischung verschiedener Komponenten dar, deren Art und Proportionen so ausgewählt sind, daß sie bestimmte wünschenswerte Qualitäten hervorrufen und verschiedene mögliche Defekte im gefrorenen Produkt verhindern. Aus diesem Grunde muß eine entsprechende Bilanz zwischen den verschiedenen Komponenten aufrechterhalten werden. Weiterhin, eine der wichtigsten Einschränkungen, die Eiskremerzeuger befolgen müssen, bezieht sich auf den Gesamtgehalt an Festsubstanz, der gewöhnlich 36 bis 39% der wäßrigen Lösung ausmacht, und selten 1 bis 2 % höher liegt. So findet man auf Seite 31 in Frandsens und Arbuckles Buch «Ice Cream and related Products» (Eiskrem und einschlägige Produkte), herausgegeben von der Avi Publishing Company, Inc. in Westport, Connecticut, in 1961, folgende Erwähnung:

«Ein schweres und wäßriges Produkt entsteht, wenn die Gesamtsubstanz zu hoch ist, gewöhnlich mehr als 40 bis 42 %».

Die vorliegende Erfindung ist auf dem Gedanken aufgebaut, daß es wünschenswert ist, eine einfache und sparsame Methode vorzusehen, um im eigenen Heim eine Süßspeise herzustellen, die alle Eigenschaften einer hochwertigen Eiskrem besitzt und doch bis zu einem bisher unerreichbaren Überlauf von etwa 200 % und darüber hinaus geschlagen werden kann (das heißt, das dreifache Volumen der ursprünglichen wäßrigen Mischung und darüber hinaus), so daß die geschlagene und schließlich gefrorene Süßspeise ein wesentlich geringeres Festsubstanzgewicht pro Volumeinheit aufweist als konventionelle hergestellte Eiskrem. Dabei wird ein Produkt von geringeren Kosten pro Volumeinheit erzielt, das gleichzeitig den Anforderungen der Leute entspricht, die auf ihr Gewicht aufpassen müssen, und die daran Gefallen finden werden, daß sie eine Portion Eiskremprodukt, welche einer Portion konventioneller Eiskrem entspricht, serviert bekommen können, die einen wesentlich geringeren Kaloriengehalt hat als die letzterwähnte.

Ein brauchbarer höherer Überlauf kann nicht durch einfaches Erhöhen des zu schlagenden Volumens von Standardmischungen erzielt werden, da sonst ein flaumiges, schneecartiges und unschmackhaftes Produkt erhalten wird. Frühere Lehren weisen darauf hin, daß sich weitere Schwierigkeiten daraus ergeben werden, wenn man versuchen wird, das Ausmaß von verschiedenen Komponenten von Standardformeln zu vergrößern, in dem Bemühen, ein zufriedenstellendes Produkt mit höherem Überlauf zu erzielen. So darf die Magermilchfestsubstanz nicht erhöht werden, da dies die Tendenz für die Milchezuckerkrystallisierung vergrößern würde, die eine sogenannte «Versandung» hervorruft. Tatsächlich ist das Problem der «Versandung» verursacht durch Auskrystallisierung von Milchezucker so ernsthaft, daß es zum Gebrauch von milchezuckerfreier Milchfestsubstanz (Trockenmilchfestsubstanz) geführt hat. Weiterhin muß der Rohrzuckergehalt innerhalb bestimmter Grenzen aufrechterhalten werden, nicht nur um übergroße Süßigkeit zu vermeiden, sondern auch weil der Zucker den Gefrierpunkt herabsetzt und das Frieren deshalb schwieriger macht.

Auch das Ersetzen von Rohr- und Rübenzucker in Eiskremmischungen durch Maiszuckerfestsubstanz muß nach Frandsen & Arbuckle's Empfehlungen (Supra, Seite 50) begrenzt werden, so daß solche Festsubstanz ein Viertel bis ein Drittel des Zuckergehaltes ausmachen dürfen. Der bisherige Stand der Technik lehrt einwandfrei, daß der Überlauf unter 100 % verbleiben muß; nur in seltenen Fällen wurde eine geringe Erhöhung über diese Zahl gestattet.

Es ist auch bekannt, daß, je höher der gesamte Festsubstanzgehalt der Mischung ist, umso niedriger ist das Ausmaß der Schlagfähigkeit der Eiskremmischungen nach den bisher gebräuchlichen Methoden, so daß es äußerst schwierig, wenn nicht unmöglich, wäre, einen Überlauf von 200 % unter Vergrößerung der gesamten Festsubstanz zu erzielen, um die erwünschte Volumvergrößerung durch bisher gebräuchliche Methoden, wie z. B. des mechanischen Schlagens, zu ersetzen.

Frühere Fachmeinungen weisen deutlich darauf hin, daß der Überlauf auf 100 % beschränkt sein muß, nur in seltenen Fällen darf diese Zahl um ein geringeres Ausmaß überschritten werden.

Es ist auch bekannt, daß je höher der Festsubstanzanteil der Mischung ist, umso geringer die Schlagmöglichkeit bei den gewohnten Methoden des Schlagens von Eiskremmischungen, weswegen es auch äußerst schwierig, wenn nicht unmöglich wäre, einen Überlauf durch Erhöhung der Gesamtstoffsubstanz von etwa 200 % bei der bisher geübten Methode des mechanischen Schlagens zwecks Vergrößerung des Volumens zu erzielen.

Es ist auch weiters bekannt, daß wenn die bisher produzierte weiche Eiskrem in einem Hauseisschrank gefroren wird, besonders wenn sie auch nur für kurze Zeit der Zimmertemperatur ausgesetzt wurde, stickig und pickig und auch sehr hart wird, so daß sie den Charakter von Eiskrem verliert. Das geschieht auch dann, wenn gefrorene Eiskrem längere Zeit der Zimmertemperatur ausgesetzt teilweise schmilzt und dann wieder gefroren wird.

Eine weitere Überlegung, die gegen eine Vergrößerung der Festsubstanz spricht, ist der Umstand, daß durch eine solche Vergrößerung naturgemäß der Wassergehalt reduziert wird, wobei eine Erhöhung der Zuckerkonzentration resultieren würde. Dadurch würde der Gefrierpunkt abgesenkt und das Einfrieren erschwert werden. Meine (weichen) Zwischenprodukte können hingegen trotz solcher Reduktion des Wassergehaltes im Hauseisschrank gefroren werden und erfordern nicht die nötigen niedrigen Temperaturen, die kommerziell benützt werden.

Ich habe gefunden, daß eine Reihe von früheren Gepflogenheiten und Vorsichtsmaßregeln verletzt und Mischungen außer Balanz gebracht werden müssen, um neuartige Eiskremmischungen durch ein Gas oder Gase, die darin löslich sind, beim Austritt aus dem Druckbehälter zu schlagen, wobei sich Produkte äußerst angenehmer Art ergeben, die man mit Recht als «Expres-Eiskrem» (oder Expres-Milcheis oder Expres-Gefrorenes) bezeichnen kann; diese Produkte weisen trotz eines weitgehend reduzierten spezifischen Gewichts (d. h. einem niedrigen Gewicht pro Gallon oder Liter) sowohl im gekühlten Zwischenstadium als auch im gefrorenen Zustand die wünschenswerteste Form, Struktur, Geschmack, Aroma und andere wesentliche Eigenschaften einer außerordentlichen eiskremartigen Süßspeise auf und sind bemerkenswert frei von Mängeln und Nachteilen, die man nach bisheriger Praxis und Erfahrungen erwartet hätte.

Ich habe die Erfahrung gemacht, daß trotz der Vergrößerung des Festsubstanzgehaltes der Eiskremmischungen, gemäß der Erfindung, ein wesentlich höherer Überlauf (von 160 bis über 250 %) dann erzielt werden kann, wenn der Austritt aus einem im Gemisch löslichen gasenthaltenden Druckbehälter erfolgt und nicht bei dem kommerziell gebräuchlichen System des mechanischen Schlagens; daß trotz der Erhöhung der Magermilch Festsubstanz (und folglich auch des Milchezuckers) der Eiskrem-Milcheis- und Gefrorenesmischungen und selbst bei weiterer Milchezuckerbeimischung aus bis jetzt noch nicht völlig verstandenen Gründen die Schlagaktion des sich ausdehnenden aufgelösten Gases die erwartete Auskrystallisierung des Milchezuckers (dem Grund der «Versandung») unterbleibt; daß trotz der vergrößerten Maiszuckerfestsubstanz die Struktur und Form der ausgedehnten Mischung höchst zufriedenstellend war und durch das Schlagen nicht gelitten hat; daß trotz höherem Gehalt von Versüßungsmitteln keine Zuckerauskrystallisierung erfolgt und mäßige Frierungs-

temperaturen auslangen und daß trotz einer proportional viel niedrigeren Vergrößerung im Gesamtfestsubstanzgehalt als dem Ausmaß des Überlaufs entspricht, eine weiche Masse beim Austritt aus dem Druckbehälter entsteht, die sich vorteilhaft mit der Substanz bekannter Eiskrem vergleichen läßt, obwohl letztere einen viel größeren Gehalt an Festsubstanz pro Volumeneinheit aufweist und an Festigkeit bekannte weiche Eiskrem übertrifft. Es wurde festgestellt, daß beigemischte Laktose (Milchzucker) nicht nur nicht kristallisiert, sondern auch das Schmelzen der weichen und gefrorenen Produkte verzögert.

Im Verfolg der Erfindung wird eine weiche Zwischen Süßspeise mit einer einmaligen Proportionskombination bei Austritt aus dem Aerosolbehälter erhalten, wobei der Überlauf bei Eiskrem und Milcheismischungen 160–250 % ausmacht und von 80–140 % bei Gefrorenmischungen (im Gegensatz zu den kommerziell erhältlichen Überläufen für Eiskrem, Milcheis und Gefrorenes von 60–100 %, respektive 40–80 % und 30 bis 50 %). Die weichen Eiskrem- und Milcheisprodukte haben eine äußerst weiche, eiskremartige Struktur, besitzen angenehmen Geschmack und Aroma und haben eine feste und fort haltende Form, obgleich der Festsubstanzgehalt nur 10–25 % über den Standardmischungen liegt, bedeutend weniger als die Vergrößerung im Volumen.

Die weichen Zwischenprodukte können nach Austreten besonders aus einem gekühlten Behälter so wie sie sind gegessen werden. Sie schmelzen sehr wenig und erhalten selbst nach einstündigem oder längerem Stehen unter Zimmertemperatur ihren Umfang und Form und zeigen keine Flüssigkeitsabgabe (das heißt kein «Zergehen»). Die geschlagenen Massen bieten daher der Hausfrau viele Möglichkeiten, ihren Einfallsreichtum zu zeigen, indem sie ungewöhnliche halb- und ganz gefrorene Süßspeisen von besonderem Aroma und Anreicherung produzieren kann, was mit teilweise geschmolzenen (und dabei erweichten) gefrorenen konventionellen Süßspeisen wie Eiskrem oder Milcheis- oder weicher Eiskrem nicht gemacht werden kann, da diese beim Wiederfrieren stickig und pickig werden. Die Zwischenprodukte gemäß der vorliegenden Erfindung werden dagegen aus dem Druckbehälter (geköhlt oder ungeköhlt) bei gleichbleibender Konsistenz und Temperatur abgegeben; sie schmelzen nicht leicht und können mit verschiedenen Geschmackssubstanzen und Füllungen wie geröstete Kaffeebohnen, «Instant» Kaffee pulver, Zimtrinde, frische, getrocknete oder glasierte Früchte, Nüssen, usw. gemischt werden, worauf die Mischung dann im Hauskühlschrank gefroren wird. Nachfolgende Portionen der geschlagenen Mischung können verschiedentlich behandelt werden, so daß derselbe Druckbehälter verschiedenartige gefrorene Süßspeisen enthalten kann. Dasselbe kann auch in Institutionen und Restaurants für den unmittelbaren Gebrauch oder sofortiges Frieren gemacht werden.

Selbst im ungefrorenen Zustand und trotz seines reduzierten Gewichtes bei Volumen, ist das weiche Zwischenprodukt durch zufriedenstellende Form, angenehmen Geschmack und Aroma gekennzeichnet; im gefrorenen Zustand ist es hochwertiger Eiskrem ebenbürtig. Wenn es aus einem gekühlten Behälter herauskommt, wird es eine weiche Expreß-Eiskrem, und somit das einzige Produkt seiner Art, das im Haus ohne viel Arbeit oder mechanischer Ausrüstung hergestellt werden kann. Selbst nachdem es durch einige Zeit unter

Zimmertemperatur gestanden ist, kann es im Gegensatz zu konventioneller Eiskrem aus der weichen Beschaffenheit ohne Auftreten von Kristallisierung, Pickigkeit und Klebrigkeit gefroren werden. Die Weichheit der Struktur wird selbst nach dem Frieren erhalten, wobei keine Zuckerkrystalle in dem gefrorenen Produkt zu finden sind, welches ein Ausmaß von Steifigkeit, angenehmer «Kaufähigkeit» und von höchst schmackhafter Art besitzt.

Das Ausströmen der aus dem Druckbehälter kommenden, vorzugsweise gekühlten Eiskrem durch die Düse kann als Überguß für Obst, Kuchen, Pfannkuchen, Waffel, Eisbecher mit Früchten und ähnlichem Verwendung finden und ist im Gebrauch mit Kaffee der Schlagsahne vorzuziehen. Bei dieser Verwendungsart ist die Verwendung von Maissirupsubstanz in zu großem Umfang zu vermeiden. Wenn keine Hitze vorhanden ist, erhält der gekühlte Überguß seine Form durch 1 1/2 Stunden bei Zimmertemperatur, und im Gegensatz zu Schlagsahne, kann es teilweise oder völlig gefroren werden und ergibt schmackhafte und geschmackvolle Süßspeisen. Die nichtgefrorene eiskremartige Süßspeise, die aus dem Druckgefäß entströmt, bietet auch eine bemerkenswerte geschmackvolle und nährreiche Nahrung für Kleinkinder und Kinder, denen man vorzugsweise gefrorene Produkte nicht verabreichen soll, und die bevorzugterweise mit sterilisierten Mischungen hergestellt werden sollen.

Während kommerzielle Eiskrem bei Temperaturen von mindestens  $-10^{\circ}\text{F}$  ( $-23,3^{\circ}\text{C}$ ) gefroren werden müssen und gewöhnlich bei  $-20^{\circ}\text{F}$  ( $-28,9^{\circ}\text{C}$ ), können die geschlagenen Mittelprodukte der vorliegenden Erfindung zufriedenstellend im Frostteil eines Haus schrankes bis zu einer zufriedenstellenden Festigkeit gefroren werden, was gewöhnlich bei einer Temperatur von etwa  $0-5^{\circ}\text{F}$  ( $-17,8$  bis  $-15,0^{\circ}\text{C}$ ) erfolgt.

In meinen verbesserten Zusammenstellungen werden Maissirupfeststoffe teilweise von Rohr- oder Rübenzucker ersetzt, bis zu einem Ausmaß von 40 % und darüber hinaus. Die Feststoffe tragen zur Form und Kautbarkeit der gefrorenen Süßstoffe bei und verursachen keine Schwierigkeit beim Schlagen durch Ausdehnung des aufgelösten (oder schwebenden) Gases.

Eine kleine Menge von entweder Natriumkaseinat oder essbarem Kalziumsalz von niedriger Lösbarkeit, oder von beiden, werden vorteilhaft bei diesen Mischungen besonders bei Eiskrem- und Milcheismischungen angewendet, da dies zur Steifigkeit und Form des Produktes beiträgt. Unter den zu verwendenden Kalziumsalzen sind Laktat, Glukonat, Zitat und Sulfat.

Meine verbesserten Mischungen, obgleich diese nur eine Erhöhung von 10–25 % über die Festsubstanzanteile konventioneller Formulierungen enthalten, ergeben nichtsdestoweniger eine ausgedehnte Masse von zufriedenstellender Form und hervorragendem Geschmack und Schmackhaftigkeit, obgleich ein Zuwachs im Volumen von mindestens dem doppelten Ausmaß gegenüber dem früheren Schlagverfahren und selbst dem dreifachen Volumen und darüber hinaus bei wässriger Eiskrem- oder Milcheismischungen stattfindet.

Wenn die Mischungen pasteurisiert sind, können die Druckbehälter für eine längere Zeit bei Zimmertemperatur aufgehoben werden; im Eisschrank können sie 6 Monate aufbewahrt bleiben, im Falle der Sterilisation bleiben die Produkte für unbestimmte Zeit frisch.

Was im vorstehenden über Eiskrem gesagt wurde, entspricht im allgemeinen auch für Milcheis, welches sich von Eiskrem durch niedrigeren Fettgehalt unterscheidet. In Gefrorenesmischungen muß mindestens ein Säuregehalt von 0,35 % aufweisen, der als Zitronensäure berechnet ist. Der Zucker und die Haltbarkeitsmittel können derartig adjustiert werden, daß sie der Struktur und Konsistenz der gebräuchlichen Gefrorenen gleichkommen.

Obgleich die Beispiele, die nachstehend angeführt werden, hochgehaltigen Süßrahm (Butterfett) als Fettquelle benützen, muß darauf hingewiesen werden, daß andere tierische und nicht tierische Fette teilweise oder zur Gänze an Stelle der süßen Sahne treten können.

Aus dem Vorstehenden ist ersichtlich, daß die Erfindung einen Druckbehälter betrifft, der entsprechend dem Volumen nur einen Teil des geschlagenen Produktes enthält, das darin geschlagen wurde. Es versetzt die Hausfrau in die Lage, sofort und leicht ein frisches Quantum von gewünschter Art einer weichen Süßspeise herzustellen, das schnell gefroren werden kann. Das bietet den zuzüglichen Vorteil, daß der Anspruch an den Eisschrankraum reduziert wird.

Der bisher bei kommerzieller Eiskremproduktion als möglich und praktisch angesehene maximale Festsubstanzgehalt war 36 1/2 % bei 10 % igem Fettgehalt und 42 % bis 16 % igem Fettgehalt (alle Prozente sind als Gewichtsprozente anzusehen), wobei die letzteren Werte ein ziemlich schweres und naßweiches Produkt ergeben. Die gewöhnlichen Zusammenstellungen für kommerzielle Eiskrem sind innerhalb folgender Grenzen: Butterfett 10–16 %, Magermilchsubstanz 8 bis 11 %, Zucker 13–17 %, Haltbarkeitsagens 0,25–0,5 % und Emulsionsbildner 0,25–0,5 %.

Die gewöhnlichen Zusammenstellungen für Milcheis enthalten: Butterfett 2–7 %, Magermilchfestsubstanz 10–13 %, Süßstoffe 14–17 % und die Gesamtfestsubstanz 29–37 %.

Gefrorenes hat gewöhnlich folgende Zusammenstellung: Butterfett 2 %, Magermilchfestsubstanz 5 % (beide durch staatliche Vorschriften begrenzt) und Zucker 25–35 %. Die gesamte Festsubstanz beträgt 32 bis 42 %.

Gemäß der Erfindung wurde die Gesamtfestsubstanz für Eiskremmischungen auf 43–54 % erhöht, für Milcheis auf 37–47 % und für Gefrorenes auf 42–59 %.

Formulierungen im Zusammenhang mit vorliegender Erfindung umfassen folgende Bestandteile: Für Eiskremmischungen 10–16 % Butterfett, 11–17 % Magermilchfestsubstanz 17–25 % Süßstoffe, 2 % Laktose (in Abwesenheit eines massigen Aromagens wie Kakao) bei einem totalen Festsubstanzgehalt von 43–54 %. Für Milcheis 3–7 % Butterfett, 15–17 % Magermilchfestsubstanz und 18–24 % Süßstoffe. Für Gefrorenes 2 % Butterfett, 5 % Magermilchfestsubstanz, 42–52 % Süßstoffe inklusive Maissirupfestsubstanz.

Der Butterfettgehalt und Festsubstanzgehalt bei Gefrorenesmischungen ist, wie vorher angezeigt, begrenzt und ich vergrößere den Festsubstanzgehalt durch Beimischung vergrößerter Anteile von Süßstoffen, wobei ein beträchtlicher Anteil von Maissirupfestsubstanz Verwendung findet. Ich kann auch den Festsubstanzgehalt durch Beigabe von Milchezucker vergrößern (der eine geringere Süßkraft als Rohr- oder Rübenzucker aufweist), so kann ich 2 % Milchezucker zur Formel 3 von nachfolgendem Beispiel zusetzen und den Wassergehalt dementsprechend verringern.

Ein Haltbarkeitsmittel wird im Ausmaß von 0,1 bis 0,5 % Gewichtsprozent gebraucht und der Emulsionsbildner beträgt 0,1–0,2 %. Die Mischungen können auch Standard-Geschmacksagenzien wie Vanille, Schokolade usw. enthalten. Frische süße Sahne ist die wünschenswerteste Butterfettquelle für den Gebrauch bei den Mischungen. Immerhin kann auch ungesalzene Butter und Butteröl verwendet werden. Falls ein Produkt mit vegetabilem Fett erwünscht ist, so soll teilweise wasserstoffhaltiges vegetables Öl oder andere annehmbare nichttierische Fette verwendet werden.

Der Gebrauch von hochkaloriger Magermilchfestsubstanz ist vorteilhaft und bildet mindestens einen Teil der Milchfestsubstanz.

Die gebräuchlichen Diabetikereiskremmischungen enthalten 16 % Butterfett, 7–10 % Magermilchfestsubstanz, 7–9 % Sorbitol mit einer Gesamtfeststoffsubstanz von 30–35 %. Bei meinen verbesserten Diabetikermischungen bleibt das Butterfett unverändert, aber die Magermilchfestsubstanz wird zu 10,4–14 % erhöht, das Sorbitol zu 14–18 %, während die Gesamtfeststoffsubstanz bis zu 40,4–48 % ansteigt.

Die gebräuchlichen Standard diätetischen Eiskremmischungen umfassen Butterfett, Magermilchfestsubstanz und kristallinisches Sorbitol; es hat eine Gesamtfestsubstanz von 25–32 %. Bei meiner verbesserten Mischung wurde die gesamte Festsubstanz bis zu 33 bis 42 % erhöht und schließt zuzüglich Gummi arabicum oder einen anderen vegetabilischen Gummi ein.

Verschiedenartige Süßstoffe können Verwendung finden, einschließlich Rohr- und Rübenzucker, Maissirup mit seiner Festsubstanz, Milchezucker und ähnliches. Bei Diabetikermischungen können Zuckerersatzstoffe wie Sorbitol verwendet werden, ebenso synthetische Süßstoffe.

Als Emulsionsbildner können die allgemein bei kommerzieller Herstellung gebräuchlichen Verwendung finden, wie Mono- und Diglyzeride von höheren Fettsäuren, ebenso wie Sorbitan und Polyoxyäthylen-Ableitungen. Ein höchst zufriedenstellender Emulsionsbildner ist TM 100VS, der eine Mischung von 80 % Mono- und Diglyzeriden und 20 % Polyoxyäthylen Sorbitan-Stearat darstellt. Eidotter kann auch verwendet werden. Es wurde festgestellt, daß diese eine gleichförmige Schlagaktion vermitteln und ein Produkt von geschmeidiger Form und Struktur.

Die Ausgleicher (Haltbarkeitsagenzien) helfen die Formierung von unerwünschten großen Eiskristallen zu verhindern. Sie umfassen Samenharz, so wie Johannisbrotharz, Gelatine (0,3–0,5 %), Algenableitungen, Irisches Moos (Carrageenins), Zellulosegummi und ähnliches.

Beim Einbringen der Mischungen in den Druckbehälter, dürfen letztere nicht vollgefüllt werden. Das Gas oder die Gasmischung wird dann in den Behälter unter solchem Druck eingepreßt, daß der Gas- oder Dampfdruck bei Zimmertemperatur 80–11 lb/Zoll<sup>2</sup> (5,62–7,03 kg/cm<sup>2</sup>) beträgt.

Die Gase die Verwendung finden können umfassen Schwefeloxydul, Kohlendioxyd, nicht giftige Polyfluor und Polychlorofluor niedrige Alkane sowie Monochlor-Pentafluorethan (Freon 115) und Oktavofluorzyklobutan oder andere Gase, die für die Beimischung mit Nahrungsmitteln allein oder als Beimischung von einem mit dem andern geeignet sind. Vorzugsweise, wenn eine Mischung von Stickstoffoxydul und Kohlendioxyd verwen-

det wird, soll der Anteil an Kohlendioxyd weniger als 30 % der gesamten Gasmischung ausmachen. In ähnlicher Weise, falls eine Mischung von Stickstoffoxydul und Freon 115 Anwendung findet, so soll die Mischung vorzugsweise 70 % Stickstoffoxydul und 30 % Freon 115 enthalten.

Es ist wünschenswert, im Aerosolbehälter einen Speicher mit verflüssigtem Gas zu haften, das entsprechend dem Fallen im Volumen der flüssigen Mischung verdunstet, wobei eine Tendenz zum Fallen des Druckes beobachtet wird, so daß ein entsprechender Druck aufrechterhalten wird. Bei einer Mischung von 75 % Freon 115 und 25 % Freon 318 in flüssiger Form (wobei letzterer den Dampfdruck des ersteren herunderdrückt), kann ein größerer Anteil des Inhaltes des Druckbehälters unter Hochdruck abgegeben werden. Das Gewichtsverhältnis von Freon 115 und 318 kann 60 : 40 oder 50 : 50 sein. Die Gase und ihre Proportionen sind so gewählt, um den erwähnten Druck bei Zimmertemperatur vorzusehen. Die Freons können mit Stickstoffoxydul vermischt werden und letzteres kann manchmal allein verwendet werden. Gewöhnlich genügen 7–15 g Gas für einen 1 Pint-Behälter (0,47 l).

Eine Mischung von 4–5 g von Stickstoffoxydul und 2 g Freon 115 wurde für eine 12 Unzen (0,36 Liter) Mischung im Pintbehälter als zufriedenstellend gefunden.

In jedem Fall wird genügend lösliches Gas in den Behälter geladen, um die kontinuierliche Schlagaktion des sich durch das Öffnen der Düse ausdehnenden Gases zu sichern. Obgleich die Freongase nicht sehr löslich sind, wird dennoch durch Schütteln des Behälters genügend schwebend in der Mischung erhalten, so daß mit Hilfe des Emulsionsbildners die Mischung beim Austritt aus dem Behälter ausgedehnt und geschlagen wird.

Der Ausdruck «Maximum von entsprechenden Standardzubereitungen», wie er in den Ansprüchen Verwendung findet, bezieht sich auf bekannte Eiskrem, Milcheis und Gefrorenesmischungen, die entsprechende kommerziell gebräuchliche Maximum-Festsbstanzgehalte aufweisen, wie vorstehend bekanntgegeben wurde.

Verschiedene Mischungen sind gemäß der Erfindung nachstehend durch Erläuterungen dargestellt, doch ist die Erfindung nicht darauf beschränkt.

#### Beispiel 1

##### Vanille Eiskremmischung (10 % Butterfett)

	Gewichtsprozente
Süßer Rahm (36 % Fett)	27,80
Magermilchpulver	14,00
Rohrzucker	10,00
Maissirupfestsbstanz (entsprechend 42 % Dextrose)	6,60
Natriumkaseinat	0,40
Milchzucker	2,00
Johannisbrotharz	0,13
Irisher Moosstoff (Carrageenin)	0,02
Emulsionsbildner (TM 100VS)	0,20
Kalziumsulfat	0,20
Vanilleextrakt	0,0225
Vanille Ölharz (6 Unzenstärke)	0,0225
Wasser	38,6050
	100,00 %

Die gesamte Festsbstanz dieser Mischung mit Ausnahme des Vanillegeschmackmittels war 45,02 %.

Diese Mischung wurde bei 160° F durch 30 Minuten pasteurisiert und homogenisiert. Hierauf wurden 10 Unzen davon in einen 16 Unzen Behälter eingebracht und bei Zimmertemperatur eine Mischung von 30prozentigem Freon 115 und 70prozentigem Stickstoffoxyd bei einem Druck von 100 lb/Zoll<sup>2</sup> (7,05 kg/cm<sup>2</sup>) in den Behälter eingeleitet.

Diese Mischung wurde dann eine kurze Zeit in einen Kühlschrank gestellt und hierauf von dem Aerosolbehälter in eine passende Schüssel entleert. Trotz eines Überlaufs von über 200 % ist das erhaltene Eiskremprodukt fest, fühlt sich gleichmäßig an und weist die Konsistenz von Eiskrem auf; es wurde als sehr geschmackvoll befunden und mit kommerzieller Vanille Eiskrem verglichen.

Beim Einfrieren wurde kein nennenswerter Verlust an Volumen beobachtet und es fand kein Auskristallisieren von Zucker statt. Das Eiskremprodukt war weder schwer noch naß oder pickig. Es war von angenehmer Leichtigkeit und besaß die wünschenswerte «Kaubarkeit».

#### Beispiel 2

##### Vanille Eiskremmischung (16 % Butterfett)

	Gewichtsprozente
Süßer Rahm (40 % Butterfett)	40,00
Magermilchpulver	12,35
Rohrzucker	9,00
Maissirupfestsbstanz (entsprechend 42 % Dextrose)	5,60
Natriumkaseinat	0,40
Milchzucker	2,00
Johannisbrotharz	0,11
Irisher Moosstoff (Carrageenin)	0,02
Emulsionsbildner (TM 100VS)	0,20
Vanilleextrakt	0,0225
Vanille Ölharz (6 Unzenstärke)	0,0225
Kalziumsulfat	0,20
Wasser	30,0750
	100,00 %

Die gesamte Festsbstanz dieser Mischung mit Ausnahme des Vanillegeschmackmittels war 48 %.

Die Mischung wurde in gleicher Weise behandelt wie in Beispiel 1, und das erhaltene Produkt war ähnlich dem im Beispiel 1 erhaltenen und hatte den Geschmack, die Konsistenz, Struktur und allgemeine Schmackhaftigkeit von kommerzieller Eiskrem von gleichem Fettgehalt, all das trotz eines Überlaufs von etwa 24 % und einer Zunahme von nur 10 % an Festsbstanz.

#### Beispiel 3

##### Milcheismischung (6 % Butterfett)

	Gewichtsprozente
Süßer Rahm (40 % Butterfett)	15,00
Magermilchpulver	15,00
Rohrzucker	10,00
Maissirupfestsbstanz (entsprechen 42 % Dextrose)	6,60
Milchzucker	2,00
Natriumkaseinat	0,40

Johannisbrotharz	0,13
Irischer Moosstoff (Carrageenin)	0,02
Kalziumsulfat	0,20
Emulsionsbildner (TM 100 VS)	0,20
Vanilleextrakt	0,0225
Vanille Ölharz (6 Unzenstärke)	0,0225
Wasser	50,4050
	100,00 %

Die gesamte Festsubstanz dieser Mischung mit Ausnahme des Vanillegeschmackmittels war 41,33 %.

Die Mischung wurde in gleicher Weise behandelt wie im Beispiel 1.

Das bei dieser Mischung erhaltene Produkt war in Geschmack und Konsistenz mit kommerziell erhältlicher Eismilch vergleichbar, obgleich der Überlauf aus dem Druckbehälter mit der vorher beschriebenen Mischung von Freon und Stickstoffoxyd 210 % betrug, bei einem Druck von 100 lb/Zoll<sup>2</sup> (7,05 kg/cm<sup>2</sup>).

#### Beispiel 4

##### Eiskremmischung für Diabetiker

	Gewichtsprozente
Süßer Rahm (40 % Butterfett)	40,00
Kondensierte Magermilch (30 % Molkefestsubstanz)	26,27
Sorbitollösung (70 %)	20,00
Natriumkaseinat	0,40
Kalziumzyklamiat	0,04
Saccharin	0,01
Johannisbrotharz	0,12
Irischer Moosstoff (Carrageenin)	0,02
Kalziumsulfat	0,20
Emulsionsbildner (TM 100VS)	0,20
Vanilleextrakt	0,0225
Vanille Ölharz (6 Unzenstärke)	0,0225
Wasser	12,6950
	100,00 %

Die gesamte Festsubstanz der Mischung war 40,95 %.

Die Mischung wurde in gleicher Weise behandelt wie in Beispiel 1 und das Diabetikerprodukt ist vergleichbar mit kommerziell erhältlicher Eiskrem in bezug auf Geschmack und Konsistenz. Der Überlauf belief sich auf etwa 205 %; weder das weiche Produkt, das aus dem Aerosolbehälter stammte, noch das gefrorene war flockig oder schaumig.

#### Beispiel 5

##### Gefrorene Mischung

	Gewichtsprozente
Süßer Rahm (40 % Butterfett)	5,00
Magermilchpulver	4,74
Rohrzucker	30,00
Maissirupfestsubstanz (entsprechend 42 % Dextrose)	12,00
Johannisbrotharz	0,14
Irischer Moosstoff (Carrageenin) Typ 2	0,02
Kalziumsulfat	0,20
Emulsionsbildner (TM 100VS)	0,20

Zitronensäure	0,35
Wasser	47,35
	100,00 %

Der gesamte Festsubstanzgehalt dieser Mischung ist 48 %.

Die Mischung wurde in gleicher Weise behandelt wie in Beispiel 1. Das so erzeugte Produkt ist mit dem kommerziell erhältlichen, normalen Gefrorenen vergleichbar.

Dieser Mischung kann ein künstlicher Obstgeschmack beigemischt werden (in dem gebräuchlichen kleinen Verhältnis) oder ein geeignetes Quantum an natürlichem filtrierten Fruchtsaft, wobei der Wasseranteil entsprechend reduziert werden muß. Die Eigenschaft des gefrorenen Produktes kann dadurch modifiziert werden, in dem die Verhältnisse des Magermilchpulvers und der Zucker variiert werden.

#### Beispiel 6

##### Schokoladeeiskremmischung

	Gewichtsprozente
Süßer Rahm (36 % Butterfett)	27,80
Magermilchpulver	11,00
Rohrzucker	13,00
Maissirupfestsubstanz (entsprechend 42 % Dextrose)	6,00
Natriumkaseinat	0,40
Kalziumsulfat	0,20
Emulsionsbildner	0,20
Johannisbrotharz	0,12
Irischer Moosstoff	0,02
Kakao	3,50
Vanillin	0,05
Wasser	37,71
	100,00 %

Die Entnahme dieser Mischung aus einem im Kühlschrank gekühlten Aerosolbehälter, der unter einem Druck von etwa 100 lb/Zoll<sup>2</sup> (7,05 kg/cm<sup>2</sup>) stand, ermöglichte den Erhalt eines schokoladekremartigen Produktes, wobei der Treibstoff und Schlagagens aus einer Mischung von Freon und Stickstoffoxyd bestand. Ein schokolademousseartiges Produkt wurde erhalten, einer weichen Eiskrem ähnlich, von feinstem Geschmelldigkeit und ausgezeichnetem Geschmack; trotz des beträchtlich niedrigeren Gehalts von Festsubstanz pro Quart oder Liter als in kommerzieller Schokoladeeiskrem, bleibt die Form bei Zimmertemperatur beträchtlich lange erhalten, frei von Zerlaufen, außerordentlich wohlschmeckend und von guter Substanz. Beim Einfrieren behält das vorliegende Produkt sein ursprüngliches Volumen und die Struktur, Dauer des Schmelzens im Mund so wie die Schmackhaftigkeit sind in vieler Hinsicht mindestens ebenso wie in hochwertiger Eiskrem. Der Überlauf beträgt etwa 235 %.

#### Beispiel 7

##### Diät Eiskremmischung

	Gewichtsprozente
Süßer Rahm (40 % Butterfett)	10,00
Magermilchpulver	18,00
Kristallinisches Sorbitol	10,00

Gummi arabicum	8,00
Johannisbrotharz	0,10
Emulsionsbildner (TM 100VS)	0,20
Kalziumsulfat	0,20
Kalziumzykamat	0,25
Vanilleextrakt	0,0225
Vanille Ölharz (6 Unzenstärke)	0,0225
Wasser	53,205
	<u>100,00 %</u>

Der gesamte Festsubstanzgehalt dieser Mischung, außer dem Vanillegeschmackmittel, ist 41,27 %.

Die Mischung wurde in gleicher Weise behandelt wie in Beispiel 1. Die eisgekühlte Mischung wurde mit einem Überlauf von über 200 % dem Druckbehälter entnommen. Die Masse war fest und geschmeidig und zeigte keinen Volumverlust beim Frieren. Struktur und Geschmack waren mit kommerzieller Diätekrem vergleichbar.

#### PATENTANSPRUCH I

Verfahren zur Herstellung einer zur Speiseerzeugung verwendbaren, weichen, formbeibehaltenden geschlagenen Masse unter Verwendung einer wässrigen Mischung als Ausgangsmaterial, dadurch gekennzeichnet, daß die Feststoffe enthaltende wässrige Mischung in einen mit einem Ventil ausgestatteten Behälter eingebracht wird, wobei der Behälter durch ein in der Mischung lösbares Gas unter Druck gestellt wird und die Menge der gesamten Festsubstanz in der Mischung so eingestellt wird, daß beim Öffnen des Ventils die Mischung durch das Ausströmen des sich in der Atmosphäre ausbreitenden Gases in aufgeschlagener Form aus dem Behälter freigesetzt wird, wobei durch das Aufschlagen das Volumen der Mischung mindestens um 200 %, bezogen auf die nicht aufgeschlagene Mischung, vergrößert wird.

#### UNTERANSPRÜCHE

1. Verfahren nach Patentanspruch I, dadurch gekennzeichnet, daß die Mischung einen Festsubstanzgehalt aufweist, der um 10-35 % über dem maximalen Feststoffgehalt der entsprechenden Standardzubereitungen liegt.

2. Verfahren nach Patentanspruch I, dadurch gekennzeichnet, daß das lösbare Gas ein Stickstoffoxyd enthält.

3. Verfahren nach Patentanspruch I, dadurch gekennzeichnet, daß das lösbare Gas ein nicht giftiges polyhalogeniertes niedriges Alkan enthält.

4. Verfahren nach Patentanspruch I, dadurch gekennzeichnet, daß das Gas im Druckbehälter eine Mischung von nicht giftigem polyhalogeniertem niedrigem Alkan und einem Stickstoffoxyd ist.

5. Verfahren nach Patentanspruch I oder einem der Unteransprüche 1-4, dadurch gekennzeichnet, daß die im Behälter befindliche Mischung Fett, Magermilchfestsubstanz, Rohr- oder Rübenzucker, einen Zucker von geringerer Süßkraft als Rohr- und Rübenzucker, ein Stabilisierungsmittel und einen Emulsionsbildner enthält, daß in dem Druckbehälter das in der Mischung lösliche Gas unter einem Druck von 5,64-7,05 kg/cm<sup>2</sup> steht und der Druckbehälter gekühlt ist und die Mischung aus dem Druckbehälter in einen auf Zimmertemperatur befindlichen Raum freigesetzt wird, wobei man eine formfeste Süßspeise erhält, die beim Einfrieren ein Produkt von gleichmäßig geschmeidiger Struktur, das praktisch frei von auskristallisierten Teilchen ist, erhält.

tur, das praktisch frei von auskristallisierten Teilchen ist, erhält.

6. Verfahren nach Unteranspruch 5, dadurch gekennzeichnet, daß die im Behälter befindliche Mischung 10-16 Gew.% Fett, 11-17 Gew.% Magermilchfestsubstanz, 17-25 Gew.% Süßmittel, inklusive Maissirupfestsubstanz, 2 % Milchezucker, geringe Mengen an Emulsionsbildnern sowie ein Stabilisierungsmittel und außerdem Natriumkaseinat und/oder ein eßbares, leicht lösliches Kalziumsalz enthält.

7. Verfahren nach Unteranspruch 5, dadurch gekennzeichnet, daß die Mischung 2-7 Gew.% Fett, 15 bis 17 Gew.% Magermilchfestsubstanz, 18-24 Gew.% Süßstoff, einschließlich Maissirup, geringe Mengen an Emulsionsbildnern sowie ein Stabilisierungsmittel und außerdem Natriumkaseinat und/oder ein eßbares, leicht lösliches Kalziumsalz enthält und vorzugsweise einen Gesamtgehalt an Feststoffen von 37 bis 47 Gew.% aufweist.

8. Verfahren nach Unteranspruch 5, dadurch gekennzeichnet, daß die Mischung 1-3 Gew.% Fett, 3 bis 7 Gew.% Magermilchfestsubstanz und 42-52 Gew.% Zucker enthält und einen Gesamtgehalt an Festsubstanz von 42-59 Gew.% aufweist.

9. Verfahren nach Unteranspruch 5, dadurch gekennzeichnet, daß die Mischung die folgende Zusammensetzung aufweist:

	Gewichtsprozente
Süßer Rahm (40 % Butterfett)	40,00
Magermilchpulver	12,35
Rohrzucker	9,00
Maissirupfestsubstanz (entsprechend 42 % Dextrose)	5,60
Natriumkaseinat	0,40
Milchezucker	2,00
Johannisbrotkernmehl	0,11
Irishes Moos	0,02
Emulsionsbildner	0,20
Vanilleextrakt	0,0225
Vanille Ölharz	0,0225
Kalziumsulfat	0,20
Wasser	30,0750
	<u>100,00 %</u>

10. Verfahren nach Unteranspruch 5, dadurch gekennzeichnet, daß die Mischung eine Schokoladecrememischung ist, die die folgende Zusammensetzung aufweist:

	Gewichtsprozente
Süßer Rahm (36 % Butterfett)	27,80
Magermilchpulver	11,00
Rohrzucker	13,00
Maissirupfestsubstanz (entsprechend 42 % Dextrose)	6,00
Natriumkaseinat	0,40
Kalziumsulfat	0,20
Emulsionsbildner	0,20
Johannisbrotkernmehl	0,12
Irishes Moos	0,02
Kakao	3,50
Vanillin	0,05
Wasser	37,71
	<u>100,00 %</u>

11. Verfahren nach Unteranspruch 5, dadurch gekennzeichnet, daß die Mischung die folgende Zusammensetzung aufweist:

	Gewichtsprozent
Süßer Rahm (40 % Butterfett)	5,00
Magermilchpulver	4,74
Rohrzucker	30,00
Maissirupfestsubstanz (entsprechend 42 % Dextrose)	12,00
Johannisbrotkernmehl	0,14
Irischer Moos (Carrageen) Typ 2	0,02
Kalziumsulfat	0,20
Emulsionsbildner (TM 100VS)	0,20
Zitronensäure	0,35
Wasser	47,35
	100,00 %

12. Verfahren nach Unteranspruch 5, dadurch gekennzeichnet, daß die Mischung 10–16 Gew. % Fett, 12,35–14 Gew. % Magermilchfestsubstanz, 9–10 Gew. % Rohrzucker, 5,60–6,60 Gew. % Maissirupfestsubstanz (entsprechend 42 % Dextrose) und 2,00 Gew. % Milchsüßholzwurzel sowie ferner Stabilisator, Emulsionsbildner, Geschmacksstoffe und Wasser enthält.

13. Verfahren nach Unteranspruch 5, dadurch gekennzeichnet, daß die Mischung eine Schokoladeneiskremmischung ist, welche 10–16 Gew. % Fett, 11 Gew. % Magermilchpulver, 13 Gew. % Rohrzucker, 6 Gew. % Maissirupfestsubstanz (entsprechend 42 % Dextrose) und 3,5

Gew. % Kakao und außerdem Stabilisatoren, Emulsionsbildner, Geschmacksstoffe und Wasser enthält.

14. Verfahren nach Unteranspruch 5, dadurch gekennzeichnet, daß die Mischung eine Eiskremmischung für Diabetiker ist, die 30–40 Gew. % süßen Rahm (40 % Butterfett) 26–30 Gew. % kondensierte Magermilch (30 % Molkenfestsubstanz), 20 Gew. % Sorbitlösung (70 % ig) und 0,5 Gew. % synthetische Süßstoffe und außerdem Stabilisatoren, Emulsionsbildner, Geschmacksstoffe, Versteifungsmittel und Wasser enthält.

15. Verfahren nach Unteranspruch 5, dadurch gekennzeichnet, daß die Mischung eine Eiskremmischung für Diabetiker ist, die 10 Gew. % süßen Rahm (40 % Butterfett), 18 Gew. % Magermilchpulver, 10 Gew. % kristallinen Sorbit, 0,8 Gew. % Gummi arabicum und außerdem Stabilisatoren, Emulsionsbildner, Geschmacksstoffe, Versteifungsmittel und Wasser enthält.

16. Verfahren nach Unteranspruch 5, dadurch gekennzeichnet, daß die Mischung Magermilchfestsubstanzen enthält, von denen mindestens ein Teil aus hochkalorigen Festsubstanzen besteht.

#### PATENTANSPRUCH II

25 Vorrichtung zur Durchführung des Verfahrens nach Patentanspruch I, dadurch gekennzeichnet, daß sie einen mit einem Ventil versehenen Druckbehälter, in dem sich die wäßrige Mischung und das Druckgas befindet, aufweist.

David Weinstein

Vertreter: E. Blum & Co., Zürich

#### Anmerkung des Eidg. Amtes für geistiges Eigentum:

Sollten Teile der Beschreibung mit der im Patentanspruch gegebenen Definition der Erfindung nicht in Einklang stehen, so sei daran erinnert, daß gemäß Art. 51 des Patentgesetzes der Patentanspruch für den sachlichen Geltungsbereich des Patentes maßgebend ist.

①⑨ RÉPUBLIQUE FRANÇAISE  
.....  
INSTITUT NATIONAL  
DE LA PROPRIÉTÉ INDUSTRIELLE  
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PARIS  
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# BREVET D'INVENTION

PREMIÈRE ET UNIQUE  
PUBLICATION

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④⑦ Publication de la délivrance..... B.O.P.I. — «Listes» n. 10 du 8-3-1974.

⑤① Classification internationale (Int. Cl.) B 05 b 1/00//A 23 p 1/00; B 65 b 31/00.

⑦① Déposant : PILLOT Jean, résidant en France.

⑦③ Titulaire : *Idem* ⑦①

⑦④ Mandataire : Jean Casanova, Ingénieur-Conseil.

⑤④ Perfectionnements apportés à la fabrication continue de produits agglomérés, à partir de  
graisses émulsionnées.

⑦② Invention de :

③③ ③② ③① Priorité conventionnelle :

La présente invention se rapporte à la fabrication continue et instantanée de produits agglomérés, à partir d'émulsions de graisses en milieu fluide dont la composition peut varier selon les usages prévus ; les constituants, à 5 l'état de gaz, de vapeur, ou de liquide, peuvent être par exemple de l'anhydride carbonique, de l'azote, du protoxyde d'azote, des fréons etc... aussi bien que de l'eau, de l'alcool, une essence volatile ou tout autre substance fluide simple ou combinée et qui peut contenir en suspension ou en solution 10 des substances conférant au mélange des propriétés spécifiques du résultat désiré, par exemple des colorants, des aromates, des émulsifiants etc...

La présente invention s'applique notamment à la fabrication de beurres hydratés et aromatisés, de mayonnaises, 15 de cosmétiques etc...

Selon l'invention, on part d'une émulsion de matière grasse que l'on conditionne ou emmagasine sous pression avec un fluide qui peut être un liquide volatil ou un gaz ou un mélange des deux, de telle sorte que l'on puisse faire 20 se détendre ladite émulsion sous forme de jet en opposant à ce jet un obstacle en forme de réceptacle contre lequel le produit obtenu par inversion de phases s'agglomère, dans un état plus ou moins foisonné.

La description qui va suivre en regard des dessins 25 annexés, donnés à titre d'exemples non limitatifs, fera bien comprendre comment l'invention peut être réalisée.

La figure 1 est une vue schématique d'une installation industrielle conforme à l'invention pour la préparation et la fabrication sur place des produits.

30 La figure 2 est une vue schématique d'une installation conforme à l'invention pour la préparation sur place et l'obtention du produit final à partir d'unités de conditionnement rendues indépendantes de la première partie de l'installation.

35 La figure 3 est une vue en coupe d'un ajutage dans lequel s'effectue l'inversion de phases et l'agglomération du produit.

La figure 4 est une vue en bout de l'applicateur de la figure 3.

Sur la figure 1, l'installation comporte une cuve 1 40 équipée d'une turbine 2 permettant de mélanger les produits

devant constituer l'émulsion grasse.

Selon l'effet recherché, l'émulsion pourra contenir des substances diverses telles que des enzymes, glucides, protéides, sels, colorants, oligo-éléments etc... ; les  
5 constituants lipidiques seront de préférence à structure globulaire naturelle ou artificielle par adjonction d'émulsifiants de préférence amphotères tels que des amino-acides et protéines, des lécithines, stérols, alcools gras, hydrates de carbonés, dextrines, gommes, alginates, pectines etc...

10 L'émulsion ainsi obtenue est envoyée par une pompe 3 vers un poste de conditionnement sous pression comprenant un mélangeur 4 à flux continu auquel aboutissent les conduites 5 d'amenée de fluides volatils gazeux.

La mise sous pression de l'émulsion a notamment  
15 pour but d'accumuler de l'énergie potentielle qui sera consommée ultérieurement dans le travail de détente, de refoulement et de malaxage du produit final.

A ce stade, l'introduction d'un liquide volatil sera préférée à celle d'un gaz lorsque les émulsions devront  
20 être conditionnées en flacon pour être inversées en d'autres lieux, comme cela sera décrit en regard de la figure 2.

Après injection de fluide dans l'émulsion, celle-ci est amenée par une conduite 6 à l'ajutage 7, pour y être transformée en produit final. Ledit ajutage sera décrit  
25 en détail en regard de la figure 3.

L'installation représentée sur la figure 2, fonctionne selon le même procédé que la précédente mais en diffère par les points suivants :

L'émulsion une fois constituée est introduite  
30 dans des flacons 8 capables de résister à la pression de conditionnement de l'émulsion ; chaque flacon est équipé ensuite d'une capsule 9 munie d'une valve de retenue du type "tout ou rien" 10 par laquelle seront introduits le ou les fluides presseurs fournis par les conduites 5.

35 Chaque valve 10 est reliée à un tube plongeur d'alimentation 11 de caractéristiques variables selon que l'on voudra utiliser le flacon en position normale ou "tête en bas".

Le fluide presseur est injecté dans l'émulsion  
40 contenue dans chaque flacon par le moyen d'un injecteur 5a qui

vient s'appliquer sur la valve dont il provoque l'ouverture.

La fermeture s'effectue ensuite par mouvement inverse, sous l'effet d'un ressort 10a et de la poussée interne du fluide.

5 L'introduction de fluide presseur assure une accumulation d'énergie qui sera consommée dans les étapes ultérieures avec production de travail et selon un processus plus ou moins endothermique.

En général, l'utilisation d'un liquide volatil  
10 sera généralement préférée à celle d'un simple gaz ; en effet, le procédé consiste à fabriquer un produit assez consistant à partir d'émulsions semi-liquides capables de se détendre à travers un ajutage.

Par ailleurs, le procédé vise à obtenir un  
15 produit relativement frais, voire glacé, en partant d'une émulsion à température ambiante.

A ces deux points de vue le liquide volatil est en effet recommandé ; que ce liquide soit miscible ou non, il est présent dans le flacon pour partie sous forme liquide et  
20 pour le reste sous forme de vapeur saturée.

Ainsi, chaque flacon pourra être rempli d'émulsion avec accumulation d'une réserve d'énergie potentielle lui conférant son autonomie pour les opérations suivantes.

En outre, le fluide présentera l'avantage de  
25 fluidifier par dilution l'émulsion d'origine plus ou moins visqueuse.

Par ailleurs, la pression de vapeur saturée étant pratiquement indépendante des quantités de fluide, la pression disponible sera constante pendant la vidange du flacon.

30 Enfin, durant la phase ultérieure de détente de l'émulsion, le changement d'état sera générateur de froid, l'abaissement de température étant pour une part directement liée à la chaleur latente du fluide presseur.

Après injection, les flacons capsulés sont munis  
35 d'un ajutage 7 qui vient s'emboîter sur le col de chacun d'eux.

La libération de l'émulsion est alors obtenue par simple pression exercée de haut en bas sur l'ajutage qui peut coulisser sur la capsule 9 pour assurer l'ouverture de la valve 10.

La figure 3 est une vue en coupe de l'ajutage ;  
40 celui-ci comporte une buse 12 raccordée à la tige creuse de la

valve 10 qui sert de tube d'alimentation ; cette buse débouche dans un pavillon 13 faisant suite à une chambre annulaire 14 entourant la buse 12 et reliée à l'atmosphère par des lumières réglables au moyen d'un obturateur 15 rotatif dont la position 5 permet de modifier l'admission d'air extérieur. Le courant d'air annulaire ainsi créé évite une dispersion du flux vésiculaire et permet de régler la détente.

La sortie du pavillon 13 est entourée par une chambre annulaire 16 cylindrique dans laquelle est engagé le 10 bord d'un fond 17 en forme de réceptacle tronconique convergent muni dans son axe d'une tubulure d'échappement 18.

A la périphérie de la chambre annulaire sont ménagées des lumières 19 qui peuvent être plus ou moins obturées par une bague coulissante 20 et par lesquelles on 15 peut laisser échapper plus ou moins de gaz et de vapeur libérés lors de la détente de l'émulsion.

La rétention plus ou moins grande de gaz et de vapeur entraîne l'existence d'une contre-pression plus ou moins grande dans le pavillon, celle-ci étant nécessaire 20 pour que s'évacue le produit venu s'agglomérer dans le réceptacle ; par ailleurs, le fait de laisser s'échapper plus ou moins de fluide gazeux permet de régler le taux de foisonnement du produit ; enfin, ce réglage permet également d'agir sur la température de sortie qui est fonction de la tension de 25 vapeur du mélange.

Le produit plus ou moins dense ainsi obtenu par inversion de phases est évacué par la tubulure 18 qui est munie de chicanes 21 qui provoquent le malaxage de la pâte plus ou moins aérée.

30 La tubulure de sortie peut être prolongée d'un applicateur 22 de préférence coudé à angle droit qui comporte une buse latérale 23 s'ouvrant par une fente allongée 24 et permettant de distribuer le produit en couche mince sur un plan quelconque, quelle que soit la position d'utilisation du 35 flacon.

L'invention peut trouver son application dans la fabrication continue et instantanée d'émulsions devant présenter au moment de l'emploi une certaine consistance et une certaine fraîcheur comme cela est le cas notamment pour le beurre et 40 des crèmes comestibles ou non, plus ou moins glacées et (ou)

cristallisées.

L'invention peut être exploitée sous forme d'installation industrielle pour la production sur place et à gros débit ou en version transportable permettant de transporter  
5 l'émulsion sans précaution particulière et éventuellement après avoir fait subir à celle-ci un traitement de longue conservation ; cette version permet alors d'obtenir un produit présentant une grande facilité d'utilisation et un état de fraîcheur permanent.

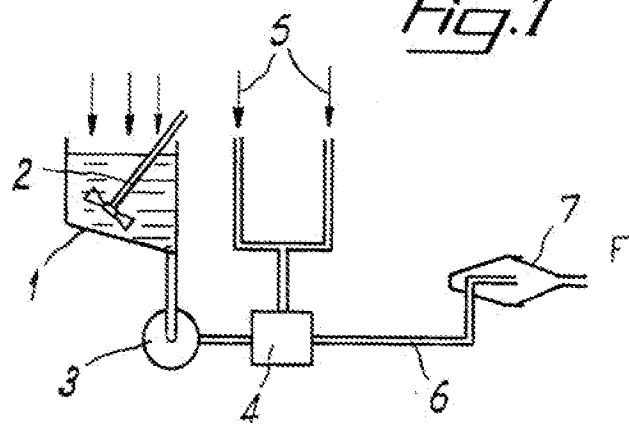
10 Il va de soi que des modifications peuvent être apportées aux modes de réalisation qui viennent d'être décrits, notamment par substitution de moyens techniques équivalents, sans sortir pour cela du cadre de la présente invention.

## REVENDEICATIONS

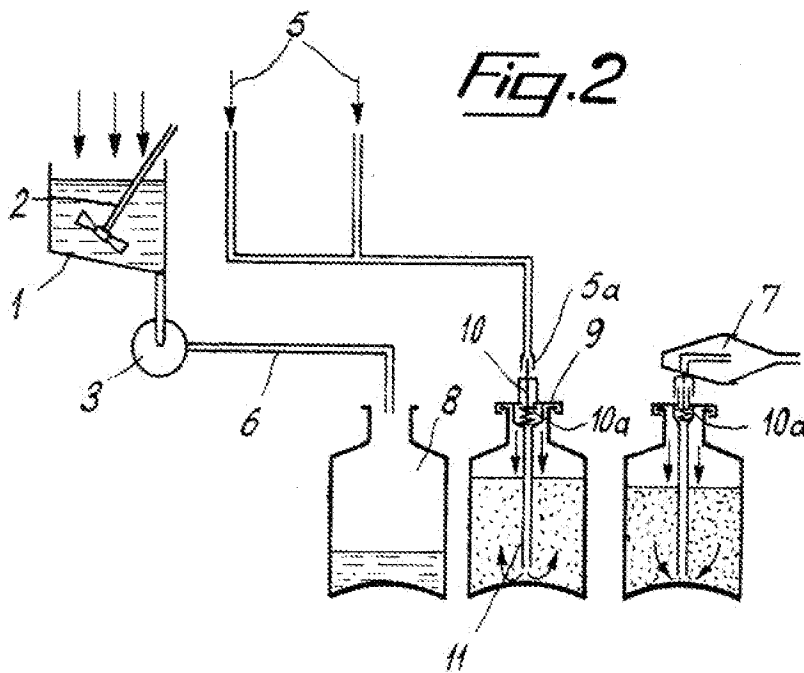
- 1.- Procédé de fabrication de produits agglomérés et réfrigérés, tels que beurres, mayonnaises, crèmes glacées, à partir d'émulsions de matières grasses, caractérisé en ce  
5 que l'on emmagasine l'émulsion avec un fluide sous pression puis on la laisse se détendre sous forme d'un jet pulvérisé en opposant à ce jet un obstacle contre lequel le produit vient s'agglomérer.
- 2.- Procédé selon la revendication 1, caractérisé  
10 en ce que le fluide sous pression est constitué par un gaz ou un liquide volatil ou un mélange des deux.
- 3.- Procédé selon l'une quelconque des revendications 1 et 2, caractérisé en ce que le fluide sous pression est mélangé avec l'émulsion.
- 4.- Installation permettant l'exécution du  
15 procédé selon l'une quelconque des revendications 1 à 3, caractérisée en ce qu'elle comprend une enceinte sous pression et un dispositif de détente raccordé à ladite enceinte.
- 5.- Installation selon la revendication 5,  
20 caractérisée en ce que le dispositif de détente comporte une buse débouchant axialement dans le col, un pavillon suivi d'une chambre de détente comportant un obstacle s'opposant au jet et en forme de réceptacle.
- 6.- Installation selon la revendication 5,  
25 caractérisée en ce que l'obstacle constitue le fond de la chambre et est prolongé par une tubulure de sortie.
- 7.- Installation selon la revendication 6, caractérisée en ce que le fond de la chambre est cylindro-tronconique et comporte dans sa partie cylindrique des  
30 ouvertures réglables par le moyen d'une bague obturant plus ou moins lesdites ouvertures.
- 8.- Installation selon l'une quelconque des revendications 5 à 7, caractérisée en ce que des moyens sont prévus pour admettre autour de la buse de détente un flux  
35 auxiliaire réglable.
- 9.- Installation selon l'une quelconque des revendications 5 à 8, caractérisée en ce que la chambre de détente comporte une tubulure de sortie avec chicanes de  
40 malaxage et à laquelle peut être adapté un distributeur coudé.

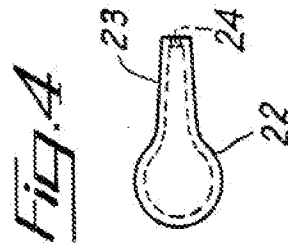
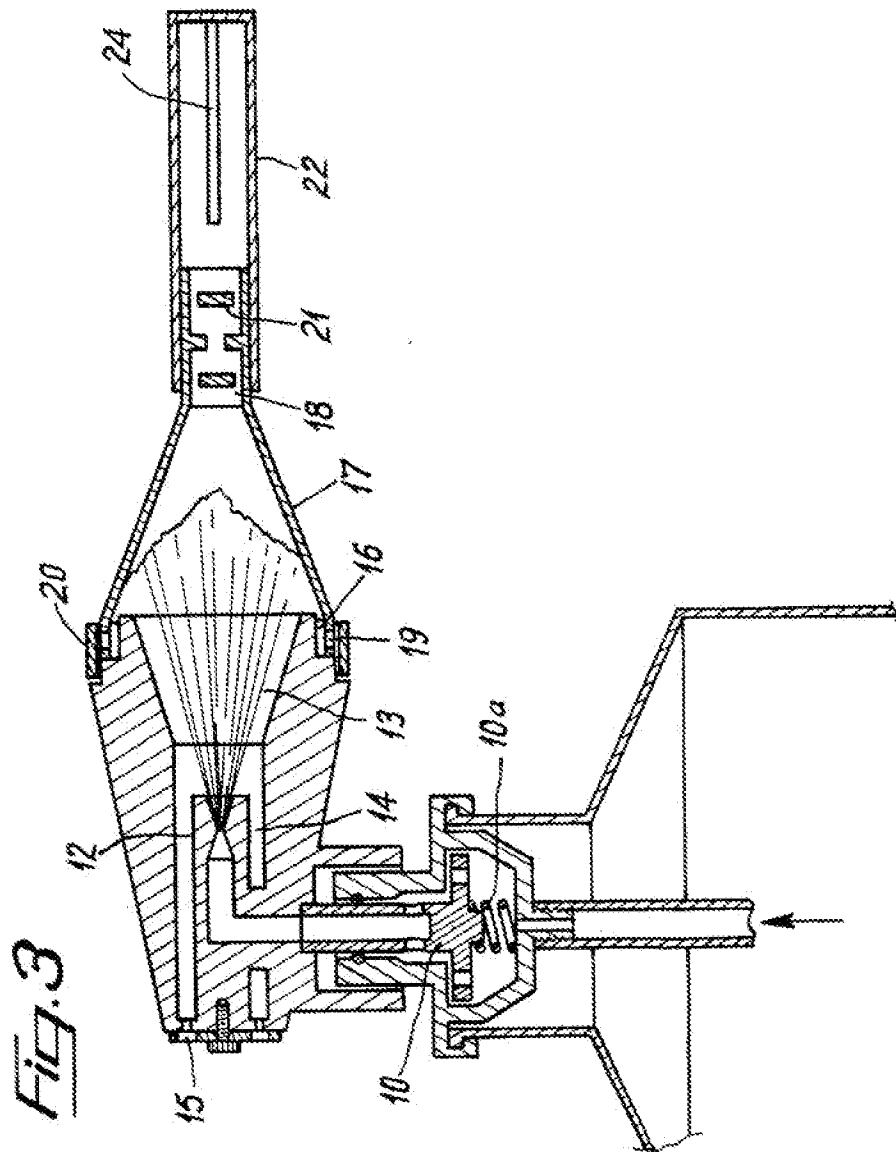
10.- Installation selon l'une quelconque des revendications 4 à 9, caractérisée en ce que le dispositif de détente peut être rendu indépendant du reste de l'installation et adapté à un récipient sous pression contenant l'émulsion.

*Fig. 1*



*Fig. 2*





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3/7/1

DIALOG(R) File 351:Derwent WPI

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008617790

WPI Acc No: 1991-121820/199117

**Creamy tasty food from aerosol spray - is foamable creamy food derived from protein mixed with aerosol gas e.g. halohydrocarbon(s)**

Patent Assignee: OSAKA GAS CO LTD (OSAG )

Number of Countries: 001 Number of Patents: 001

Patent Family:

Patent No	Kind	Date	Applicat No	Kind	Date	Week
JP 3061450	A	19910318	JP 89197256	A	19890728	199117 B

Priority Applications (No Type Date): JP 89197256 A 19890728

Abstract (Basic): JP 3061450 A

A material mixt. for cream foods, with foaming property, made proteins etc., is put into a spray bomb with an air-sol gas e.g. halo-carbohydrides etc.

USE - A new style of creamy mixt. utilised for whipped cream ice cream. (5pp Dwg.No.0/1)

Derwent Class: D13; P42; Q34

International Patent Class (Additional): A23F-003/16; A23G-009/02;

A23L-001/19; A23P-001/16; B05B-009/04; B65D-083/44

?

⑫ 公開特許公報(A)

平3-61450

⑬ Int. Cl.<sup>3</sup>

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B 05 B 9/04  
B 65 D 83/44

8114-4B  
6946-4B  
8114-4B  
7115-4B  
6977-4B  
6762-4F

7127-3E B 65 D 83/14

B

審査請求 未請求 請求項の数 5 (全5頁)

⑮ 発明の名称 エアゾール容器入り嗜好性食品

⑯ 特 願 平1-197256

⑰ 出 願 平1(1989)7月28日

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㉑ 代 理 人 弁理士 三枝 英二 外2名

明 細 書

産業上の利用分野

発明の名称 エアゾール容器入り嗜好性食品

本発明は、エアゾール容器入り嗜好性食品に関する。

特許請求の範囲

従来技術とその問題点

- ① 起泡性を有する粘性食品素材を噴射剤ガスとともにエアゾール容器内に加圧充填したことを特徴とするエアゾール容器入り嗜好性食品。
- ② 起泡性を有する粘性食品素材が、植物起源の蛋白質、油脂、乳化剤、安定剤、香料、甘味料および色素を配合した天然クリームミックスである請求項①に記載の嗜好性食品。
- ③ 起泡性を有する粘性食品素材が、抹茶濃厚液である請求項①に記載の嗜好性食品。
- ④ 噴射剤ガスが、不活性乃至非酸化性で、且つ無害なガスである請求項①に記載の嗜好性食品。
- ⑤ エアゾール容器のノズル部分が、可変構造を有するかまたは取換え可能である請求項①乃至④に記載の嗜好性食品。

発明の詳細な説明

従来から、気泡形成性のO/W型エマルジョンと噴射剤としての特定割合の亜酸化窒素および炭化水素(またはハロゲン化炭化水素)とを容器内に収容したエアゾールパッケージは、知られている(特開昭49-113780号公報)。しかしながら、この技術で噴射剤の一成分として使用する亜酸化窒素は、反応性の高い不安定な化合物であって、食品との併用には適していない。また、噴射剤の他の一成分として使用する炭化水素(例えばメタンなどの飽和脂肪族炭化水素)またはハロゲン化炭化水素(例えばフロン類、塩化メチレン、塩化ビニルなど)も、食品との併用には不適である。さらに、亜酸化窒素と炭化水素(またはハロゲン化炭化水素)との併用により形成される

気泡は、ローションなどの身体手入れ用製品においては好適な性質を有するが、やはり食品に要求される気泡としての性質を備えていない。すなわち、該公報に開示された製品では、肌が付与されるまでは、安定した気泡を維持するが、この気泡はその後急速に消えてしまうものである。

特開昭62-502194号公報は、噴射剤として炭化水素類（プロパン、ブタン、イソブタンなど）、フレオン115などを使用する食用無水エーロゾル発泡体組成物を開示している。しかしながら、この場合にも、使用する噴射剤は、食品用としては、決して好適であるとは言えない。

一方、気泡を含み、粘性を有する食品としては、アイスクリーム、アイスクリーム代替物（非乳系の原料を使用する）などが存在している。例えば、その代表的なアイスクリームの製造に際しては、下記の工程が必要である。

（イ）各種の原料をミキサーで混練することによ

り、乳化液を調製する。

（ロ）オートクレープ、湯浴などを使用して、80℃程度で乳化液を殺菌する。

（ハ）冷蔵庫において、4℃程度で乳化液を熟成する。

（ニ）アイスクリーマー、ジェラートマシンなどのアイスクリーム製造機械により、フリージングする。

（ホ）冷蔵庫内に製品を保存する。

しかしながら、通常この様にして大量生産されるアイスクリームには、種々の問題点がある。すなわち、フリージング工程では、殺菌済みの熟成した乳化液を攪拌しつつ冷却硬化させることにより、“空気を含む氷菓”という形態に導く。このフリージング工程に際しての空気の混入率（オーバーラン）は、製品の食感、味などに大きく影響するものである。しかるに、大量生産の場合には、均一な製品品質の確保のために、アイスクリーム

製造機械は、オーバーランが特定の値となる様に設定されている。従って、消費者の様々な好みに応じて種々の食感、味などのアイスクリームを製造することは、極めて困難である。さらにまた、大量生産され、通常の流通機構を経て販売されるアイスクリームは、流通の過程で環境温度の変化によるエマルジョンの破壊により、製品表面への霜付着、水分の揮散による食感の劣化などを生じやすい。また、流通の過程での細菌による汚染などの衛生上の危険性も存在する。

また、一般家庭においてアイスクリーム製造機械を使用することなくアイスクリームを製造する場合には、冷蔵庫で硬化させた乳化液をスプーンなどで掻き混ぜ、再び冷蔵庫で冷却するという煩雑な作業を行わなければならない。この場合にも、アイスクリームの食感、味などをそれぞれの好みに調整することは容易ではない。

#### 問題点を解決するための手段

本発明者は、上記の様な技術の現状に留意しつつ、嗜好性食品として特に適した材料の組合わせおよび嗜好性食品の製造方法について研究を進めた結果、遂に本発明を完成するに至った。

すなわち、本発明は、下記のエアゾール容器入り嗜好性食品を提供するものである：

- ① 起泡性を有する粘性食品素材を噴射剤ガスとともにエアゾール容器内に加圧充填したことを特徴とするエアゾール容器入り嗜好性食品。
- ② 起泡性を有する粘性食品素材が、植物起源の蛋白質、油脂、乳化剤、安定剤、香料、甘味料および色素を配合した天然クリームミックスである上記項①に記載の嗜好性食品。
- ③ 起泡性を有する粘性食品素材が、抹茶濃厚液である上記項①に記載の嗜好性食品。
- ④ 噴射剤ガスが、不活性乃至非酸化性で、且つ無害なガスである上記項①に記載の嗜好性食品。
- ⑤ エアゾール容器のノズル部分が、可変構造を

有するかまたは取換え可能である上記項①乃至④に記載の嗜好性食品。

本発明において、“起泡性を有する粘性食品素材”とは、それ自体一定の粘度を有していて噴射剤とともに容器外に押し出された場合に、その内部に気泡を形成し、その気泡を保持し得る食品素材を意味する。このような食品素材は、通常粘性の高い液状乃至エマルジョン状のものであり、気泡形成能を改善するために起泡剤を含んでいても良い。

起泡性を有する粘性食品素材としては、より具体的にはアイスクリーム製造用乳化物、乳原料に代えて植物性原料を使用するアイスクリーム様氷果製造用乳化物、ムース菓子製造用乳化物、抹茶濃縮液、ドレッシング、スープ濃縮液などが例示されるが、本発明では、コレステロール含有量の少ない植物性原料を使用するもの、例えば、植物性原料を使用するアイスクリーム様氷果製造用乳

通常粘性食品素材として90～99.9重量%程度であり、より好ましくは95～99.5重量%程度である。

エアゾール容器は、通常食品素材収容部分を構成する容器本体、食品素材および噴射剤の流出をコントロールするバルブ部ならびに製品の形態を規定するノズル部からなっている。エアゾール容器は、衛生上の観点から、ライニング加工したスズメッキ鉄材、アルミニウムまたはアルミニウム合金製とすることが好ましい。

エアゾール容器本体は、その食品素材収容部分を隔壁で複数部分に分けておき、そのそれぞれに異なる特性（組成、色、香り、味、食感、テクスチャーなど）の食品素材を収容することができる。この場合には、エアゾール容器のノズル部を回転可能な構造としておくことにより、異なる特性の食品素材を順次押し出して、多層状の気泡性食品を製造することが出来る。或いは、複数の収

化物、抹茶濃縮液などがより好適である。

必要に応じて配合される起泡剤としては、食品用の起泡剤として公知の蛋白質分解物、高級アルコール、しょ糖-脂肪酸エステル、グアーガム、ローカストビーンガム、キサンタンガム、アラビアガム、カラギーナン、タマリンドガム、トラガムなどの天然ガムなどが例示される。

本発明において噴射剤として使用するガスは、人体に対して無害であり、且つ容器内に充填された状態で食品素材に対し影響を及ぼさないものである必要がある。このようなガスとしては、不活性乃至非酸化性のものであれば、限定されないが、窒素ガスおよび炭酸ガスが特に好適である。ある種のフロンガスも上記の要件を一応充足するが、環境上の観点から本発明では使用しない。

エアゾール容器内での起泡性を有する粘性食品素材と噴射剤との充填割合は、エアゾール容器の大きさ、粘性食品の種類などにより変わり得るが、

容部分にそれぞれ繋がるバルブを備えたノズル部を使用することにより、異なる特性の食品素材を混合しつつ押し出して、色、味などの混ざり合った気泡性食品を製造することが出来る。或いはさらに、ノズル孔の径、形状、構造などの異なる複数のノズルを適宜取り替えることにより、消費者の嗜好に応じた気泡発生状態の製品を得ることも可能である。

得られた気泡含有状態の製品は、そのまま飲食しても良い。

また、本発明における起泡性を有する粘性食品素材が、例えば、アイスクリーム製造用乳化物或いはアイスクリーム様氷果製造用乳化物である場合には、所望の形状或いは気泡発生状態となる様に所定の容器に噴射した後、冷蔵庫で冷却して食しても良く、冷凍庫で凍結して氷菓として食しても良い。

さらに、起泡性を有する粘性食品素材が、例え

ば、抹茶濃縮液である場合には、適温の湯に対して噴射することにより、直ちに香り高い抹茶が得られる。

#### 発 明 の 効 果

粘性食品素材が、エアゾール容器内に加圧充填されており、罐気状態におかれているので、酸化による劣化が防止され、また、細菌による汚染も防止される。従って、常温或いは冷蔵状態での長期保存が可能となる。

エアゾール容器のノズル部の形状、寸法などを変えることにより、オーバーランを調整して、個人の嗜好に応じた製品を得ることができる。

特に、アイスクリーム或いはアイスクリーム様氷菓を得るには、起泡物を冷凍庫で凍結するだけで良い。

また、粘性食品素材として抹茶濃縮液を使用する場合には、適温の湯上にこれを噴射するだけで、飲み頃の香り高い抹茶が容易に得られる。

以下に実施例を示し、本発明の特徴とするところをより一層明確にする。

#### 実施例 1

常法に従って下記組成の植物性クリームミックスを調製し、殺菌し、熟成させた。

第 1 表

成分	重量(%)
植物性蛋白質	4
甘味料	18
植物性油脂	10
乳化剤+安定剤	0.5
抹茶	2
水	65.5

かくして得られた植物性クリームミックスを①アイスクリームマシーンを使用する従来技術によるフリージングする方法、②CO<sub>2</sub>とともにエア

ゾール容器内に加圧充填し、適当な入れ物に噴射した後、冷凍庫にて凍結する方法および③N<sub>2</sub>とともにエアゾール容器内に加圧充填し、適当な入れ物に噴射した後、冷凍庫にて凍結する方法により、氷菓を得た。

第2表にクリームミックス製造後直ちに得た氷菓の物性、ならびにクリームミックスを調製後所定時間経過後に得た氷菓の経時変化の状態を示す。第2表中、一般細菌数および大腸菌群生菌数菌、固体数/gを示し、色調は、色差計(日本電色(株)製)により測定した。

第 2 表

調製後経過時間(日)	一般細菌数	大腸菌群生菌数	色調	経時変化	①	②	③
0日	30~80	7170	52/-10/20(L/a/b)	52/-15/19	150~250	300~450	150~250
10日	10以下	30以下	52/-8/18	52/-9/19	590	590	1370
20日	10以下	30以下	52/-9/17	51/-13/28	10以下	10以下	10以下
30日	10以下	30以下	60/-9/17	61/-8/18	10以下	10以下	10以下
40日	10以下	30以下	60/-9/17	61/-8/18	10以下	10以下	10以下
50日	10以下	30以下	60/-9/17	61/-8/18	10以下	10以下	10以下
60日	10以下	30以下	60/-9/17	61/-8/18	10以下	10以下	10以下
70日	10以下	30以下	60/-9/17	61/-8/18	10以下	10以下	10以下
80日	10以下	30以下	60/-9/17	61/-8/18	10以下	10以下	10以下
90日	10以下	30以下	60/-9/17	61/-8/18	10以下	10以下	10以下
100日	10以下	30以下	60/-9/17	61/-8/18	10以下	10以下	10以下
110日	10以下	30以下	60/-9/17	61/-8/18	10以下	10以下	10以下
120日	10以下	30以下	60/-9/17	61/-8/18	10以下	10以下	10以下
130日	10以下	30以下	60/-9/17	61/-8/18	10以下	10以下	10以下
140日	10以下	30以下	60/-9/17	61/-8/18	10以下	10以下	10以下
150日	10以下	30以下	60/-9/17	61/-8/18	10以下	10以下	10以下
160日	10以下	30以下	60/-9/17	61/-8/18	10以下	10以下	10以下
170日	10以下	30以下	60/-9/17	61/-8/18	10以下	10以下	10以下
180日	10以下	30以下	60/-9/17	61/-8/18	10以下	10以下	10以下
190日	10以下	30以下	60/-9/17	61/-8/18	10以下	10以下	10以下
200日	10以下	30以下	60/-9/17	61/-8/18	10以下	10以下	10以下
210日	10以下	30以下	60/-9/17	61/-8/18	10以下	10以下	10以下
220日	10以下	30以下	60/-9/17	61/-8/18	10以下	10以下	10以下
230日	10以下	30以下	60/-9/17	61/-8/18	10以下	10以下	10以下
240日	10以下	30以下	60/-9/17	61/-8/18	10以下	10以下	10以下
250日	10以下	30以下	60/-9/17	61/-8/18	10以下	10以下	10以下
260日	10以下	30以下	60/-9/17	61/-8/18	10以下	10以下	10以下
270日	10以下	30以下	60/-9/17	61/-8/18	10以下	10以下	10以下
280日	10以下	30以下	60/-9/17	61/-8/18	10以下	10以下	10以下
290日	10以下	30以下	60/-9/17	61/-8/18	10以下	10以下	10以下
300日	10以下	30以下	60/-9/17	61/-8/18	10以下	10以下	10以下

第2表に示す結果から明らかな様に、エアゾール容器に収容したものの方が、空気を多く含み、軽く、舌触りおよび口溶けが良く、また色も良く保持されている。

また、同じエアゾール容器に充填したものでも、噴射剤の種類によって、泡の性状がかなり異なっている。すなわち、噴射剤としてN<sub>2</sub>ガスを使用する場合に比して、CO<sub>2</sub>ガスを使用する場合には、食感の軽い製品が得られる。

#### 実施例2

実施例1と同一組成の植物性クリームミックスをCO<sub>2</sub>とともに第1図に大要を示す構造のエアゾール容器に充填し、種々の口径のノズルから噴射した。即ち、エアゾール容器本体(3)に設けられたバルブ部(2)にノズル部(1a)を取り付け、充填物の噴射を行い、ノズル口径と得られた製品のオーバーランおよび食感との関係を調べた。

以上の結果から明かなように、ノズル径が小さい程、またバルブからノズルまでの距離が短い程、オーバーランは大きい。

このことから、ノズルの口径およびノズルまたは形状を変えることにより、噴射剤を変える場合と同等またはそれ以上の大きな変化を製品にもたらしことができる。

#### 図面の簡単な説明

第1図は、本発明の一実施態様において使用するエアゾール容器の大要を示す斜視図である。

(1a)、(1b)、(1c) …ノズル部

(2) …バルブ部

(3) …エアゾール容器本体

(以上)

代理人 弁理士 三 枝 英 二



結果を第3表に示す。

第 3 表

ノズル口径(mm)	オーバーラン (%)	食 感
1.5	120~250	軽い
0.7	300~450	軽い
0.4	350~600	大変軽い。ムダ味

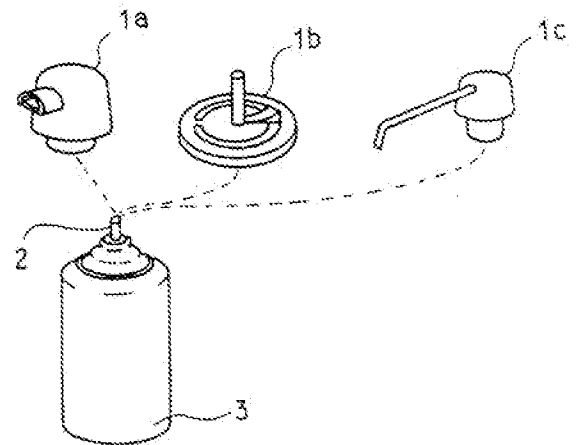
また、上記のエアゾール容器に第1図に示すノズル部(1b)または(1c)を取り付け、上記と同様の充填物の噴射を行い、ノズル形状と得られた製品のオーバーランおよび食感との関係を調べた。なお、各ノズルの口径は、0.4mmであった。

結果を第4表に示す。

第 4 表

ノズル形状	オーバーラン (%)	食 感
1a	300~450	軽い。
1b	360~550	大変軽い。
1c	80~250	軽い

第 1 図



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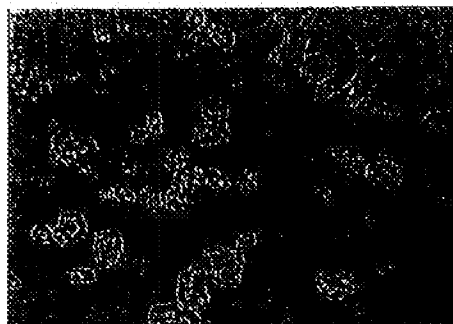
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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

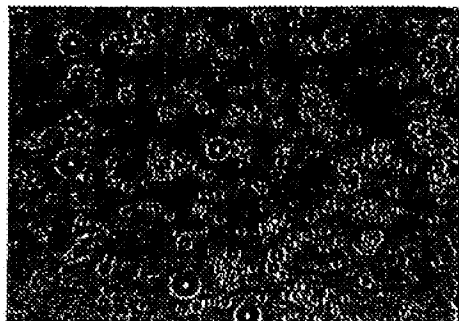
(54) Title: AERATED FROZEN PRODUCTS

Microscopic picture of ice crystals in heat shocked samples

1. Standard



2. Test



(57) Abstract: A process for the production of aerated frozen products by preparing a mixture of ingredients suitable for a frozen aerated product, adding an emulsifier mixture, aerating the mix to obtain an aerated mix having an overrun of about 20 % to about 250 %, and about 5 % to about 100 % for the aerated frozen ice cream and water ice, respectively, and freezing the aerated mix to produce the aerated ice cream or water ice.



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AERATED FROZEN PRODUCTSFIELD OF THE INVENTION

5 The present invention is directed to an aerated frozen product, including, but not limited to, ice cream, water ice, frozen yogurt, etc., and the methods for preparing the aerated frozen products.

BACKGROUND OF THE INVENTION

10 Traditionally, molded aerated frozen bars, ice cream, or water ice are manufactured by partially freezing an ice cream mix, ice milk mix, frozen yogurt mix, water ice mix, or fruit juice mix in conventional batch or continuous freezers followed by pumping and filling the mix into molds  
15 of different shapes and sizes. During the last decade, a new generation of freezers has been developed which are equipped with pre-whippers that enable the mix to be pre-aerated before being partially frozen in the freezer. The molded products are usually quiescently frozen using a  
20 cold brine system at  $-30^{\circ}\text{C}$  to  $-40^{\circ}\text{C}$ . If desired, after demolding, the molded products may be coated with chocolate or compound coating. Finally, the products are usually packaged and stored at about  $-30^{\circ}\text{C}$  until transport and distribution.

25 This traditional process for manufacturing molded aerated frozen bars, ice milk, yogurt, ice cream, or water ice has limitations. For example, the partial freezing of the mix in the freezer, followed by quiescent freezing in  
30 the molds, leads to the formation of an icy texture, loss of air, and formation of large air cells in the product having a size range of about 110-185 microns (Arbuckle, W.S. Ice Cream, Fourth Edition, 1986, Van Nostrand Reinhold, New York, p 234). Shrinkage of the products is  
35 often a problem and when eating the product, a very cold feeling in the mouth is experienced. Furthermore, it is difficult to achieve more than 20% overrun in water ice, a typical overrun is from 0% to 20% and usually is about 5%.

It is very difficult to achieve more than 80% overrun and almost impossible to achieve an overrun of 120% or higher in finished ice cream products using conventional manufacturing.

5 Non molded products have similar problems. Air cells and ice crystals start growing immediately after production of non molded products. Significant air cell and ice crystal growth occurs during transportation, storage at the grocery store or during transportation and storage of the  
10 products by the consumer. None of the available non molded ice cream or water ice products inhibit or delay air cell or ice crystal growth after production or during hardening, transportation, or distribution.

Currently, there is no process that can produce very  
15 stable finely aerated frozen ice cream, ice milk, yogurt, or water ice having an average air cell size of less than 50 microns and an average ice crystal size of 25 microns or that are heat shock resistant for a period of time after production. Thus, there is a need for finely aerated ice  
20 cream, ice milk, yogurt or water ice that maintain a smooth texture, do not suffer from shrinkage, do not give a very cold feeling in the mouth, have an uniform appearance without large air pockets on the surface and have a significantly higher heat shock resistance. Moreover, no  
25 process can produce a stable overrun of more than 20% to about 100% for water ice products or an overrun between about 20% to about 250% for ice cream products. The present invention provides products and processes which overcome these disadvantages.

30

#### SUMMARY OF THE INVENTION

The present invention relates to a process for the production of aerated frozen products comprising the steps of preparing a mixture of ingredients suitable for  
35 preparing a aerated frozen product, adding an emulsifier or mixture thereof in a suitable amount to obtain a mix, aerating the mix to obtain an aerated mix having an overrun of about 20% to about 250% for ice cream products and an

overrun of about 5% to about 100% for water ice products, and freezing the aerated mix to form the aerated frozen product. In this process, the mix can be an ice cream mix, a water ice mix, a fruit juice mix, a frozen yogurt mix, a sherbet mix, or a mixture thereof.

The emulsifier mixture comprises at least one emulsifier capable of facilitating the formation and stabilization of fat  $\alpha$ -crystals and present in an amount of about 0.01% to about 3% by weight of the mix. The emulsifier can be at least one of propylene glycol monostearate, sorbitan tristearate, lactylated monoglycerides, acetylated monoglycerides, or unsaturated monoglycerides, preferably the emulsifier mixture comprises propylene glycol monostearate, sorbitan tristearate, and unsaturated monoglycerides.

The mix of ingredients is typically prepared using conventional methods such as by combining the ingredients with shear mixing to disperse and solubilize them into a homogeneous mass, followed by homogenizing the mass and pasteurizing the homogenized mass. The homogenizing step can be conducted in a two stage homogenizer at a pressure of about 70 bar to about 250 bar in the first stage and of about 0 bar to about 50 bar in the second stage. Also, the mix can be aged after pasteurization by storing at a temperature of about 0°C to about 6°C for about 1 hour to about 24 hours. If desired, the mix can be colored and flavored before being aerated at a temperature of about 0°C to about 12°C to obtain the desired overrun. Preferably, the aerated mix is directly fed to a container or mold and frozen to produce the aerated frozen product, with the freezing being allowed to take place quiescently at a temperature of about -25°C to about -45°C.

The aerating step can be conducted by allowing the mix pass through a conventional freezer at a temperature of about -4°C to about -7°C. In contrast, for molded products, the aerating step can be a whipping step conducted by using a conventional mixer at a speed of about 150 rpm to about

1000 rpm and at a flow rate of about 10 L/h to about 1000 L/h.

5 The invention also relates to an aerated frozen ice cream or water ice which comprises a mixture of ingredients suitable for frozen aerated ice cream or water ice and at least one emulsifier for facilitating formation and stabilization of fat  $\alpha$ -crystals.

10 The aerated frozen ice cream or water ice have an overrun of about 20% to about 250% and of about 5% to about 100%, respectively, and contain air cells having an average size of less than about 50 microns which cells are uniformly distributed throughout the ice cream or water ice and which are substantially invisible to the naked eye. Preferably, the aerated frozen products have air cells with  
15 an average size of about 15 microns to about 40 microns and an ice crystal size of less than about 30 microns. The process produces an aerated frozen product having a smooth texture similar to an extruded ice cream and heat shock resistant such that the apparent change in product volume  
20 after heat shock treatment is less than about 5% by volume.

If desired, the aerated frozen products can contain inclusions or have a coating that optionally contains inclusions, which are added before or during freezing. Further, the aerated frozen products may be in shell and  
25 core products with ice cream as a core and water ice, fruit juice, fruit ice, real fruit, or a mixture thereof as a shell or coating. The latter having an overrun of about 0% to about 20%.

### 30 BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings:

Figure 1 illustrates ice crystals in a conventionally molded aerated ice cream bar after heat shock.

35 Figure 2 illustrates ice crystals in a molded aerated ice cream bar, made by a process for producing frozen aerated ice cream, after heat shock.

Figure 3 illustrates ice crystals of conventionally prepared ice cream samples (standard) and ice cream samples of the present invention (test).

Figure 4 illustrates ice crystals of heat shocked conventionally prepared samples (standard) and samples of the present invention (test).

Figure 5 illustrates a comparison of air bubble distribution of conventionally prepared standard samples and samples prepared using the present invention before and after heat shock treatment.

#### DETAILED DESCRIPTION OF THE INVENTION

It has now been found that aerated frozen products mix can be finely aerated in a freezer to a desired overrun by using an emulsifier blend for bulk ice cream, bulk water ice, bulk yogurt, individual ice cream portions, cones, bars, etc. The emulsifier blend preferably contains a mixture of propylene glycol monostearate, sorbitan tristearate, and unsaturated monoglycerides. This procedure eliminates the whipping step of the prior art which either conducts a whipping step prior to freezing followed by molding, or partially freezes a mixture, followed by molding. Neither process of the prior art provides a frozen ice cream, ice milk, yogurt, or water ice product that has a fine and stable aerated structure.

The emulsifier blend of the present invention facilitates and stabilizes fat  $\alpha$ -crystals. Typically, in conventionally prepared frozen products, fat is present in a  $\beta$ -crystal structure. The fat  $\beta$ -crystal is an energetically lower crystal structure and thus, a preferred configuration for fat crystals. The emulsifier blend of the present invention, however, facilitates the formation and stabilization of the higher energy configuration fat  $\alpha$ -crystals in the frozen aerated products.

The presence of fat  $\alpha$ -crystals in the aerated frozen products has several advantages. The fat  $\alpha$ -crystal configuration supports and stabilizes a fat film or

structure surrounding the air cells which prevents small air cells from agglomerating into larger air cells. Also, the surface areas of the fat  $\alpha$ -crystals serve as barriers that do not allow ice crystals, within the aerated frozen products, to grow into larger ice crystals. The formation of small air cells and their stabilization through fat  $\alpha$ -crystals substantially restricts the growth of ice crystals and this in turn, creates an aerated frozen product with a smoother, creamier texture and which is heat shock resistant.

Furthermore, the process of the present invention yields an ice cream product with an unconventionally high overrun of about 20% to about 250% and an unconventionally high overrun for water ice products of about 5% to about 100%. Moreover, the aerated frozen products have a significantly higher resistance to shrinkage and heat shock, have a smoother uniform air pocket free appearance, and a creamier and more desirable eating quality compared to conventionally prepared products.

The term "aerated frozen products," as used herein, unless otherwise indicated, means ice cream, water ice, yogurt, frozen yogurt, sherbert, fruit ice, low fat ice cream, ice milk, etc.

The term "heat shock," as used herein, unless otherwise indicated, means the temperature fluctuations related to the storage and transportation of frozen ice cream, ice milk, yogurt, or water ice product. Heat shock can be simulated by treating a frozen ice cream product to temperature cycling of about  $-8^{\circ}\text{C}$  to about  $-20^{\circ}\text{C}$  every 12 hours, with 30 min temperature ramp time for a period of about two weeks, or by any other method commonly used in the industry.

The mixture suitable for an aerated frozen product may be any conventional mix such as an ice cream mix, a frozen yogurt mix, a water ice mix, a fruit juice mix, a sherbet mix, or a combination thereof with the emulsifier blend used in the present invention. An ice cream mix may

contain fat, non-fat milk solids, carbohydrates, or stabilizers together with water and, if desired, other conventional ingredients such as mineral salts, colorants, flavorings, inclusions, etc. A water ice mix comprises  
5 fruit juices, sugar, stabilizer, and small amounts of milkfat and non-fat milk solids.

A typical aerated frozen product mix may contain fat in an amount of about 0.5% to about 18% by weight based on the total weight of the mix, non-fat milk solids in an  
10 amount of about 6% to about 15% by weight based on the total weight of the mix, sugar in an amount of about 10% to about 15% by weight based on the total weight of the mix, a sweetener in an amount of about 3% to about 8% by weight based on the total weight of the mix, an emulsifier blend  
15 in an amount of about 0.01% to about 3% by weight based on the total weight of the mix, and a stabilizer in an amount of about 0.1% to about 1% by weight based on the total weight of the mix.

The fat used may be a dairy fat, a non-dairy fat, or a  
20 mixture of both. When the fat is a dairy fat, it may be for instance, any milk fat source such as butter oil, butter, real cream, or a mixture thereof. When the fat is a non-dairy fat it may be, for instance, an edible oil or fat, preferably a vegetable oil such as coconut oil, palm  
25 kernel oil, palm oil, cotton oil, peanut oil, olive oil, soy bean oil, etc., or mixtures thereof.

The sugar used may be sucrose, glucose, fructose, lactose, dextrose, invert sugar either crystalline or  
30 liquid syrup form, or mixtures thereof.

The sweetener may be a corn sweetener in either a crystalline form of refined corn sugar (dextrose and fructose), a dried corn syrup (corn syrup solids), a liquid corn syrup, a maltodextrin, glucose, or a mixture thereof.

35 The emulsifier may be at least one emulsifier that facilitates formation and stabilization of fat  $\alpha$ -crystals. The emulsifiers include but are not limited to propylene glycol monostearate ("PGMS"), sorbitan tristearate ("STS"),

lactylated monoglycerides, acetylated monoglycerides, unsaturated monoglycerides, including monoglycerides with oleic acid, linoleic acid, linolenic acid, or other commonly available higher unsaturated fatty acids.

- 5 Preferably, the emulsifier blend comprises at least one of PGMS, STS, or unsaturated monoglycerides. More preferably the emulsifier blend comprises a combination of PGMS, STS, and unsaturated monoglycerides. The emulsifier blend should be present in an amount of about 0.01% to about 3%,  
10 preferably of about 0.1% to about 1%, and more preferably of about 0.2% to about 0.5% by weight of the mix. Preferably the emulsifier blend should be present in a combination of PGMS, STS, and unsaturated monoglycerides. PGMS, STS, and unsaturated monoglycerides should be present  
15 in an amount of about 0.1% to about 1%, of about 0.01% to about 0.2%, and of about 0.01% to about 0.2% by weight of the mix, respectively. Preferably, PGMS, STS, and unsaturated monoglycerides should be present in an amount of about 0.2% to about 0.5%, of about 0.02% to about 0.05%,  
20 and of about 0.02% to about 0.1% by weight of the mix, respectively. More preferably, the emulsifier blend should be present in a combination of PGMS, STS, and unsaturated monoglycerides and in amounts of about 0.25% to about 0.35%, of about 0.02% to about 0.03%, and of about 0.02% to  
25 about 0.05% by weight of the mix, respectively.

- The stabilizer may be, for instance, a hydro-colloid such as agar, gelatin, gum acacia, guar gum, locust bean gum, gum tragacanth, carrageenan and its salts,  
30 carboxymethyl cellulose, sodium alginate or propylene glycol alginate, or any mixture of hydro-colloids.

- A typical process for the preparation of aerated frozen products can be carried out using conventional equipment. The first step comprises mixing the ingredients  
35 under shear mixing to disperse and/or solubilize the ingredients into a homogeneous mass. One of ordinary skill in the art with little or no experimentation can determine mixing time and conditions to obtain the desired

homogeneous mass. Thereafter, the homogeneous mass is preheated, e.g., to a temperature of about 62°C to about 75°C. The preheated homogeneous mass is conventionally homogenized, e.g., in a two stage homogenizer. The first stage is conducted at a pressure of about 70 bar to about 250 bar, preferably of about 100 bar to about 150 bar, more preferably about 150 bar. The second stage is conducted at a pressure of about 0 bar to about 50 bar, preferably of about 20 bar to about 35 bar. Subsequently, pasteurization of the homogenized mass is conducted under conditions commonly used in the industry.

The pasteurization step is conducted at a temperature of about 50°C to about 100°C, preferably of about 60°C to about 85°C for a time of about 10 seconds to about 30 minutes, preferably for time of about 30 seconds followed by cooling to a temperature of about 0°C to about 10°C, preferably at a temperature of about 4°C. Preferably, pasteurization is conducted by either high temperature short time (HTST) or low temperature long time (LTLT) processing.

After pasteurization, the mix is preferably aged by allowing to stand at a temperature of about 0°C to about 6°C, preferably of about 1°C to about 5°C and for a time of about 1 hour to about 24 hours, preferably of about 2 hours to about 18 hours and more preferably of about 4 hours to about 12 hours.

The mix is then colored and flavored as needed.

Subsequently, the mix is allowed to aerate in a conventional freezer for bulk, extruded, or cone products. If the mix is allowed to aerate in a conventional freezer, the draw temperature of the frozen aerated product should be sufficient to generate a viscosity and shear in the freezer barrel to create fine air cells of average mean diameter of 50 microns or less after hardening of the aerated frozen product. Typically, drawing temperatures include about -4°C to about -10°C, preferably of about -5°C to about -8°C.

If the mix is whipped using a conventional freezer, any freezer commonly used in the industry can be used to whip the mixture, e.g. Hoyer, CBW, PMS, etc. The mix is normally pumped into the freezer at a temperature of about 0°C to about 8°C, preferably of about 2°C to about 4°C and substantially simultaneously an appropriate amount of air is introduced into the mix. Depending upon overrun desired in the final product a skilled artisan can easily determine the amount of air required. The step of freezing under agitation is conducted depending upon the freezing point of the mix. Typically, the step is conducted at a temperature of about -4°C to about -8°C, preferably of about -5°C to about -6°C. The time required is dependent on the amount of mix and air, and the pumping flow rate. An artisan can easily determine this without undue experimentation.

Subsequently, the aerated frozen product is packaged into bulk containers, extruded for bars or cones, or packaged into small containers. Bulk containers include container sizes of 3 gallons to 0.5 L, and small containers include container sizes of 250 ml to 50 ml.

The overrun for ice cream products aerated using a conventional freezer is in the range of about 20% to about 250%, preferably of about 40% to about 175%, more preferably of about 80% to about 150%. The overrun for molded ice cream products aerated using a whipper is in the range of about 40% to about 200%, preferably of about 80% to about 150%. The overrun for aerated water ice is in the range of about 5% to about 100%, preferably of about 20% to about 60%.

The aerated mix is then fed, preferably directly, to a container, e.g., by pumping through a filler, and then allowed to harden. Hardening may be allowed to take place either by using blast freezers or nitrogen tunnel at a temperature of about -30°C to about -60°C or quiescently at a temperature of about -25°C to about -45°C, preferably of about -30°C to about -40°C, or by other conventionally acceptable methods.

The aerated frozen products may afterwards be stored at a freezing temperature, usually at a temperature in the range of about  $-25^{\circ}\text{C}$  to about  $-35^{\circ}\text{C}$ , preferably of about  $-28^{\circ}\text{C}$  to about  $-32^{\circ}\text{C}$ , and more preferably at about  $-30^{\circ}\text{C}$ . If  
5 desired, the product can be repackaged before shipping. Also for individual sized portions the aerated frozen products may be coated, for instance with chocolate or a compound coating. Compound coatings include coatings which do not contain 100% cocoa fat and coatings that contain any  
10 vegetable oil, such as canola oil, corn oil, soy oil, coconut oil, etc., or mixtures thereof. These coatings may also contain inclusions such as nut pieces, fruit pieces, rice crisps, or other additives therein. Furthermore, the aerated frozen product may be placed between cookies, or  
15 other edible substrates to form ice cream sandwiches or the like. The final aerated frozen products are then packaged and stored at a freezing temperature.

The aerated frozen products may include a shell rather than a coating. The shell material may include fruit  
20 juice, fruit ice, real fruit, water ice, or mixtures thereof. The shell may also have an overrun of about 0% to about 20%.

The aerated frozen product produced by the process of  
25 the present invention has a creamier and warm eating quality, and a smooth, uniform, homogeneous texture and appearance, with small air cells of an average size of less than about 50 microns uniformly distributed substantially none of which are visible to the naked eye. Preferably,  
30 the small air cells have an average size of about 15 microns to about 40 microns, and more preferably of about 20 microns to about 35 microns. The aerated frozen products have an average ice crystal size less than ice  
35 crystals in conventionally prepared ice cream or water ice before and after heat shock, improved heat shock resistance and improved shrinkage resistance.

The aerated frozen products of the present invention have an average air cell size of less than 50 microns and

ice crystal size of about 25 microns. The frozen aerated products of the present invention, after heat shock subsequent to production, have an average air cell size similar to the untreated product, an average ice crystal size below about 30 microns, and an apparent change in product volume of less than about 5% by volume. Also, the frozen aerated products can maintain a smoother and creamier texture and mouth feel, do not suffer from shrinkage, and do not give a cold feeling in the mouth.

To summarize, the aerated frozen products produced by the process of the present invention have a texture which is smoother, creamier and have a warmer mouth feel than a conventionally ice cream or water ice even at lower overruns. The present invention also provides an aerated frozen ice cream having an overrun of about 20% to about 250% and a water ice having an overrun of about 5% to about 100% with small air cells uniformly distributed and substantially none of which are visible to the naked eye.

Figure 1 illustrates the ice crystals of a conventionally prepared molded aerated ice cream bar after heat shock, taken with a microscope at -20°C. The ice crystals are substantially larger and straighter in shape. Figure 2 illustrates the ice crystals of aerated frozen ice cream prepared as taught by the present invention taken with a microscope at -20°C. Figure 2 shows that the ice crystals in products produced according to the present invention are thinner than ice crystals of conventionally prepared frozen bars and of a substantially curved rod like shape.

Figure 3 illustrates the ice crystals of a conventionally prepared ice cream sample (standard) as compared to an ice cream sample made using the present invention. The standard ice cream sample clearly contains ice crystals of larger size than the ice crystals of the ice cream sample using the present invention. Additionally, Figure 4 demonstrates that the standard ice cream sample after heat shock treatment contains larger ice

crystals in comparison to the test sample prepared using the present invention.

The relationship shown in figures 3 and 4 is graphically represented in figure 5 where air bubble distribution for both standard and test samples (samples prepared by the present process) is tabulated. The standard sample air cell size, represented by the accumulated area distribution, drastically increases after heat shock treatment, thus indicating severe air cell size growth. In contrast, the test sample accumulated area distribution is unaffected by heat shock treatment. Consequently, after heat shock treatment, the average ice crystal size in the test sample remains constant while conventionally prepared ice cream undergoes significant ice crystal growth.

#### EXAMPLES

The following Examples and accompanying drawings further illustrate the present invention.

##### Example 1

An ice cream mix was prepared from 8% (by weight) partially hydrogenated palm kernel oil, 11% nonfat milk solids, 12% sucrose, 6% corn syrup solids (36DE) and 0.5% of a stabilizer blend containing combinations of hydrocolloids such as guar, locust bean gum, carrageenan, carboxymethyl cellulose, etc. together with an emulsifier mixture capable of facilitating the formation and stabilization of fat  $\alpha$ -crystals. The ingredients were mixed with agitation to disperse and solubilise them into a homogeneous mass, homogenized with a two stage homogenizer at 2000 psig pressure at the first stage and 500 psig pressure at the second stage, followed by HTST pasteurization.

After pasteurization, the mix was aged by refrigerated storage at a temperature of 4°C for 6 hours.

The aged mix was colored, flavored, and then aerated in an Oakes Mixer at a temperature of 4°C to an overrun of 130%.

5 The aerated mix was pumped to a mold and allowed to freeze to give the frozen molded bar. The freezing was allowed to take place quiescently at a temperature of -40°C using cold brine. The frozen molded bar was demolded and subsequently coated with chocolate crunch bar at 35°C, packaged, and stored at -30°C.

10

The frozen molded bar produced by the process of the present invention had a creamier and warm eating quality of an extruded product, a smooth, uniform, homogeneous texture and appearance, with small air cells of an average size of  
15 less than 50 microns uniformly distributed substantially none of which were visible to the naked eye. The molded aerated frozen bar had a quick melt with substantially no lingering of product in the mouth. Ice crystals in the molded aerated frozen bar had a unique thin and  
20 substantially curved rod like shape and an average size of less than ice crystals in a conventionally molded aerated ice cream bar after heat shock, and had improved heat shock and shrinkage resistance.

25

#### Example 2

A water ice mix was prepared from 23% (by weight) sucrose, 7% corn syrup solids (36 DE) and 0.6% stabilizer blend containing combinations of hydrocolloids, such as guar, locust bean gum, pectin, carboxymethyl cellulose,  
30 gelatin, microcrystalline cellulose, hydrolyzed soy or milk proteins, etc. with an emulsifier mixture capable of facilitating the formation and stabilization of fat  $\alpha$ -crystals. The ingredients were mixed with agitation to disperse and solubilise them into a homogeneous mass in  
35 water, homogenized with a two stage homogenizer at 1500 psig pressure at the first stage and 500 psig pressure at the second stage, followed by HTST pasteurization.

After pasteurization, the mix was aged by refrigerated storage at a temperature of 4°C for 6 hours.

The aged mix was colored, flavored, acidified (e.g. adding citric acid solution), and then aerated in an Oakes  
5 Mixer at a temperature of 4°C to an overrun of 100%.

The aerated mix was then pumped to a mold and then allowed to freeze to give the frozen molded bar. The freezing was allowed to take place quiescently at a temperature of -40°C using cold brine. The frozen molded  
10 bar was demolded, and then packaged and stored at -30°C.

The frozen molded bar produced by the process of the present invention had the creamier and warm eating quality of an extruded product, a smooth, uniform, homogeneous texture and appearance, with air cells substantially none  
15 of which were visible to the naked eye. The molded aerated frozen bar had a quick melt with substantially no lingering of product in the mouth.

#### Example 3

20 An ice cream was prepared using the ingredients described in Table I using a conventional freezer as a whipper. The ice cream product had an overrun of 120%. The draw temperature at the freezer outlet was constant at -6°C. After whipping the ice cream in a freezer, the  
25 product was placed into containers, conventionally hardened, and stored at -30°C.

TABLE I

Ingredients	Percent Composition	
	Conventional	New
Fat	10	10
Non-fat milk solids	7.5	7.5
Whey solids	2.5	2.5
Sugar	12.5	12.5
Corn syrup solids, 36 DE	4.5	4.5
Guar	0.15	0.15
CMC	0.05	0.05
Carrageenan	0.02	0.02
Mono-diglycerides or monoglycerides	0.30	-
Propylene glycol monostearate	-	0.3
Sorbitan tristearate	-	0.03
Unsaturated monoglycerides	-	0.05
Water	62.5	62.4
Total solids	37.5	37.6

To compare heat shock resistance, ice cream products made according to the present invention and using conventional methods were tested. Both types of ice cream products were treated to heat shock, as described above, or alternatively for 6 days at -8°C. Ice crystals, air bubble size and sensory attributes of the products were evaluated before and after the products were heat shock treated. Generally, the ice cream products using the present emulsifier system remained smoother and comparable to fresh standard products. (Table II and Figures 3 and 4).

Additionally, the ice crystals and air bubble growth of the products according to the present invention were highly restricted during heat shock as compared to conventionally made ice cream products. (Figure 5).

5

Table II

Treatment	Method of Sample Preparation	
	Conventional	Present invention
Fresh/Not treated	6.6	8.1
Heat Shocked	4.7	8.3

\* Measured by a trained sensory panel using a smoothness scale of 0 to 10. 0 being the least and 10 being the most smooth product.

10

THE CLAIMS

What is claimed is:

- 5           1. A process for the production of aerated frozen products comprising the steps of preparing a mixture of ingredients suitable for preparing a frozen aerated product, adding an emulsifier mixture in a suitable amount to produce a mix wherein the emulsifier mixture comprises  
10       at least one emulsifier capable of facilitating formation and stabilization of alpha fat crystals, aerating the mix to obtain an aerated mix having an overrun of about 5% to about 250% and freezing the aerated mix to form an aerated frozen product.
- 15           2. The process according to claim 1, which further comprises selecting the mix to be an ice cream mix, a water ice mix, a fruit juice mix, a frozen yogurt mix, a sherbet mix, ice milk mix, or a mixture thereof.
- 20           3. The process according to claim 1, wherein the emulsifier mixture comprises at least one emulsifier capable of facilitating formation and stabilization of alpha fat crystals in an amount of about 0.01% to about 3%  
25       by weight of the mix.
4. The process according to claim 3, wherein the emulsifier is at least one of propylene glycol monostearate, sorbitan tristearate, lactylated  
30       monoglycerides, acetylated monoglycerides, or unsaturated monoglycerides.
5. The process according to claim 3, wherein the emulsifier mixture comprises a blend of propylene glycol monostearate, sorbitan tristearate, and unsaturated  
35       monoglycerides.

6. The process according to claim 1, wherein the mix of ingredients is prepared by combining the ingredients with shear mixing to disperse and solubilize them into a homogeneous mass, followed by homogenizing the mass and pasteurizing the homogenized mass.

7. The process according to claim 6, wherein the homogenizing step is conducted in a two stage homogenizer at a pressure of about 70 bar to about 250 bar in the first stage and of 0 bar to about 50 bar in the second stage.

8. The process according to claim 6, which further comprises aging the mix after pasteurization by storing the mix at a temperature of about 0°C to about 5°C for about 1 hour to about 24 hours.

9. The process according to claim 1, which further comprises coloring and flavoring the mix before aerating in a mixer at a temperature of about 0°C to about 12°C to obtain the desired overrun.

10. The process according to claim 1, wherein the aerated frozen product is water ice and the overrun is about 5% to about 100%.

11. The process according to claim 1, wherein the frozen aerated product is ice cream and the overrun is about 20% to about 250%.

12. The process according to claim 1, wherein the aerating step is conducted by allowing the mixture to pass through a conventional freezer with a draw temperature of about -4°C to about -7°C.

13. The process according to claim 1, wherein the aerating step is a whipping step conducted by using a

conventional mixer at a speed of about 10 L/h to about 1000 L/h.

14. The process according to claim 1, wherein the  
5 whipped mix is formed as individual serving portions, and those portions are provided with a coating or shell.

15. The process according to claim 14 which further  
10 comprises providing inclusions in the coating or shell.

16. An aerated frozen ice cream comprising a mixture  
of ingredients suitable for frozen aerated ice cream and at  
least one emulsifier for facilitating formation and  
stabilization of fat alpha crystals, the ice cream having  
15 an overrun of about 20% to about 250%, uniformly  
distributed small air cells having an average size of less  
than about 50 microns, ice crystals, a smooth texture, and  
heat shock resistant.

17. The aerated frozen ice cream according to claim  
20 16, wherein the small air cells have an average size of  
about 15 microns to about 40 microns.

18. The aerated frozen ice cream according to claim  
25 16, wherein the ice crystal size is less than about 30  
microns.

19. The aerated frozen ice cream according to claim  
30 16, wherein the apparent change in product volume after  
heat shock treatment is less than about 5% by volume.

20. An aerated frozen water ice comprising a mixture  
of ingredients suitable for aerated frozen water ice and at  
least one emulsifier for facilitating formation and  
35 stabilization of fat alpha crystals, the water ice having  
an overrun of between about 5% to about 100%, uniformly  
distributed small air cells having an average size of less

than about 50 microns, a smooth texture, and heat shock resistant.

5        21. The aerated frozen water ice according to claim 20, wherein the small air cells have an average size of about 15 microns to about 40 microns.

10       22. The aerated frozen water ice according to claim 20, wherein the ice crystal size is less than about 30 microns.

23. The aerated frozen ice cream according to claim 20, wherein the change in product volume after heat shock treatment is less than about 5% by volume.

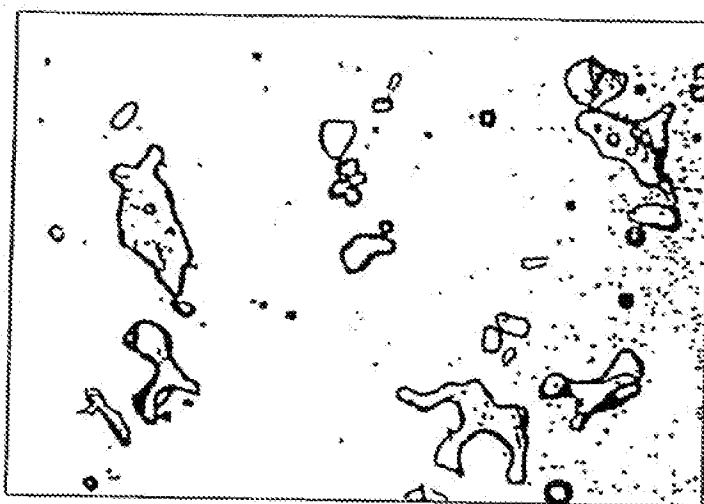


FIG. 1  
PRIOR ART

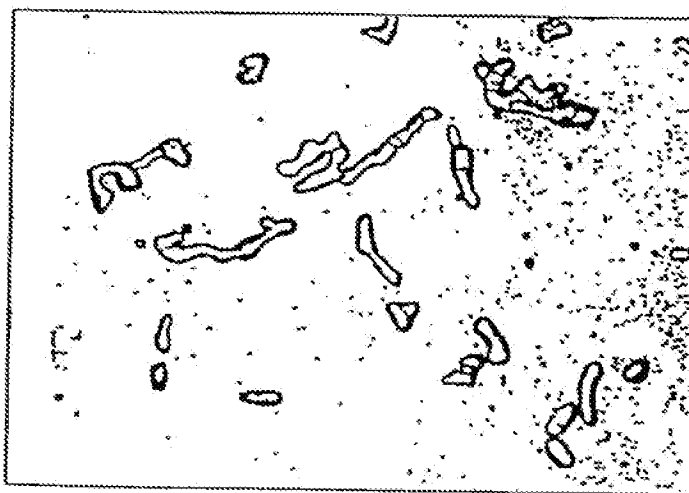
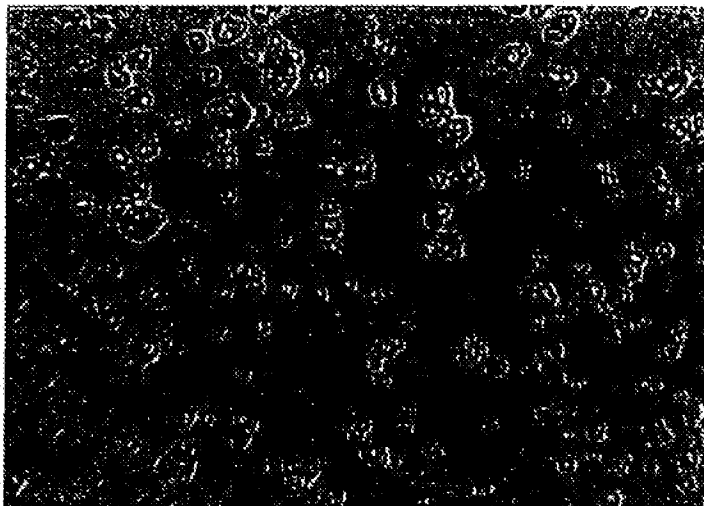


FIG. 2

FIGURE 3

Microscopic picture of ice crystals in fresh samples

1. Standard



2. Test

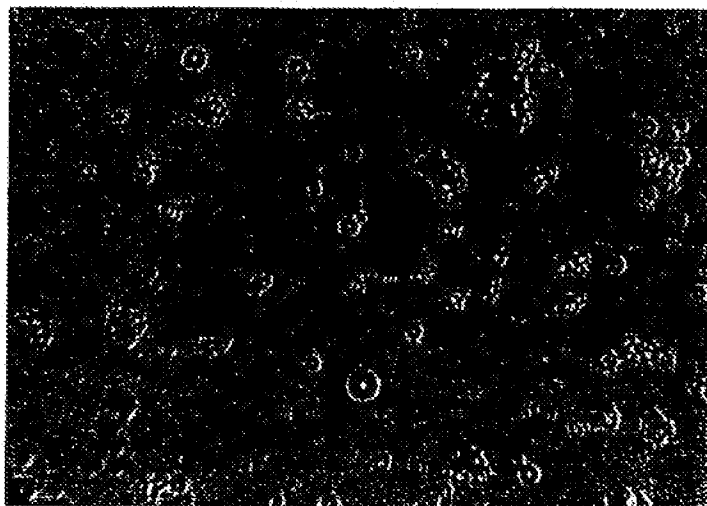
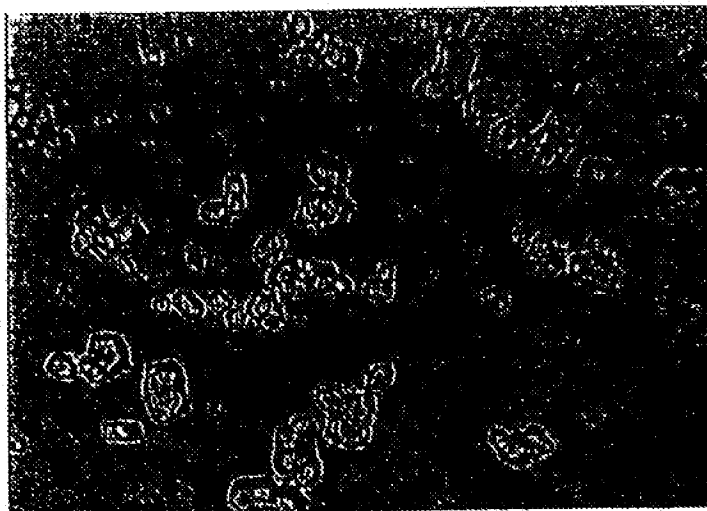


FIGURE 4

Microscopic picture of ice crystals in heat shocked samples

1. Standard



2. Test

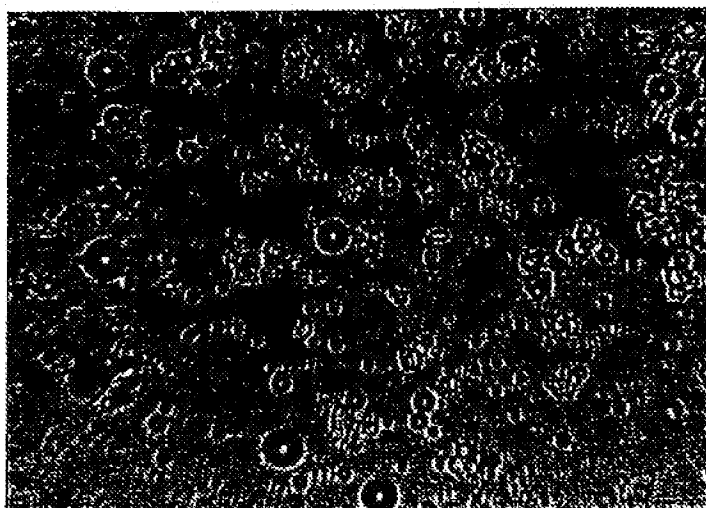
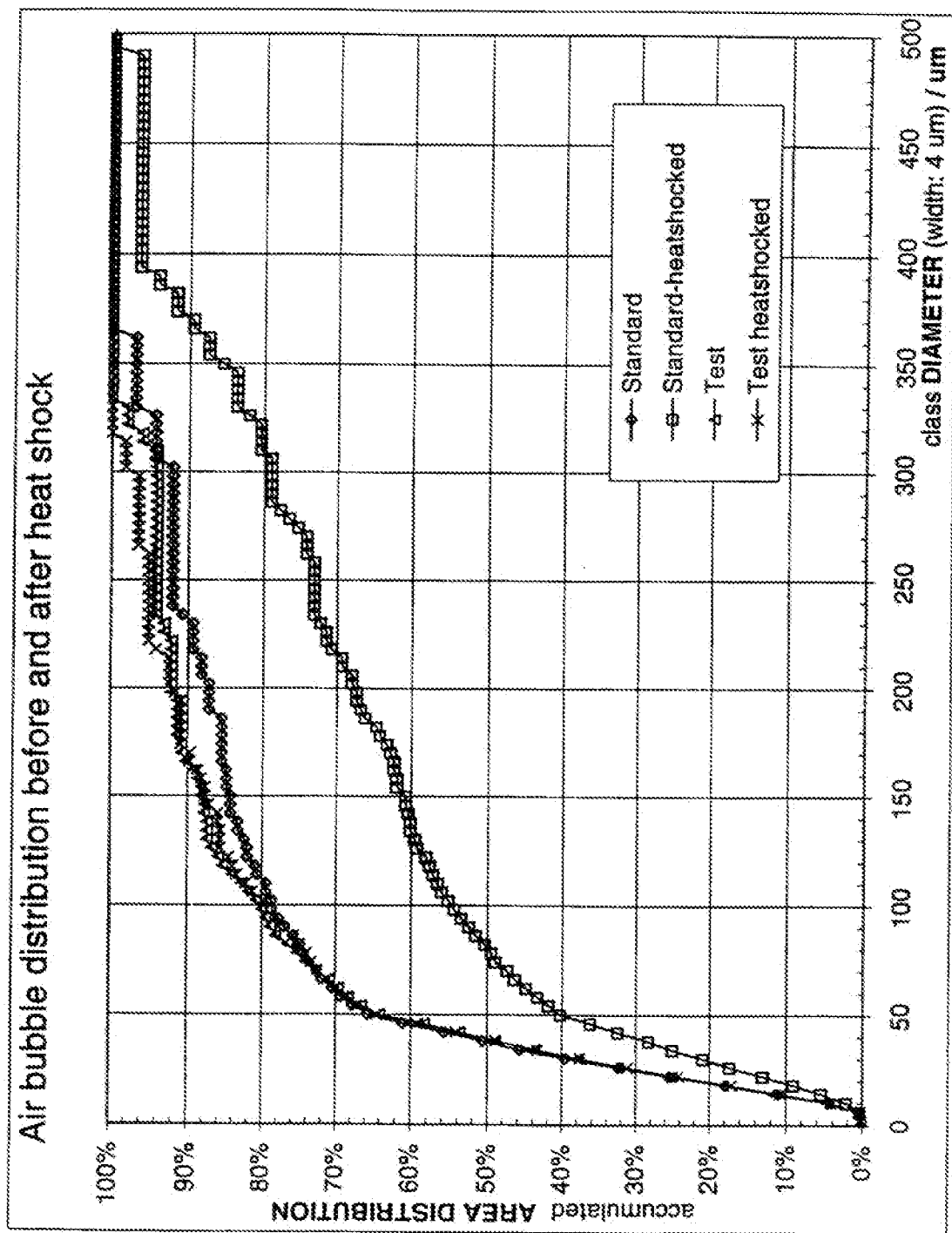


FIGURE 5



# INTERNATIONAL SEARCH REPORT

International Application No.

PCT/EP 00/06250

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 A23G9/02

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A23G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 505 943 A (DELL WILLIAM J ET AL) 19 March 1985 (1985-03-19)	1,2,4,6, 7,9,11, 16-19
Y	column 2, line 63 -column 3, line 15 column 4, line 8 -column 5, line 18; claims; examples	10,20-23
Y	US 4 724 153 A (DULIN GARY T ET AL) 9 February 1988 (1988-02-09) the whole document	10,20-23
X	GB 1 446 144 A (KRAFTCO CORP) 18 August 1976 (1976-08-18)	1-4,10, 11,16-23
Y	page 2, line 1 - line 23 page 2, line 113 -page 3, line 65; claims; examples	5



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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Date of the actual completion of the international search

17 October 2000

Date of mailing of the international search report

24/10/2000

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## INTERNATIONAL SEARCH REPORT

Intern al Application No

PCT/EP 00/06250

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5 084 295 A (PETROSSIAN VANIK D ET AL) 28 January 1992 (1992-01-28) the whole document	5
X	US 3 673 106 A (JONAS JOHN J ET AL) 27 June 1972 (1972-06-27) column 13, line 54 -column 14, line 2; claims	1-4, 11, 16-19
X	US 5 384 145 A (GONSALVES ALEXANDER A ET AL) 24 January 1995 (1995-01-24)  column 2, line 46 - line 59 column 3, line 8 - line 60; claims column 1, line 37 - line 42 column 2, line 6 - line 17; claims	1, 2, 4, 6-9, 11, 16-19
A	US 4 452 824 A (COLE BRUCE A ET AL) 5 June 1984 (1984-06-05)	
X	US 4 451 492 A (DELL WILLIAM J ET AL) 29 May 1984 (1984-05-29) the whole document	1, 2
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